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AUTOMOTIVE INDUSTRIES

LAND — AIR — WATER

AUGUST 27, 1938

"NO MORE HORN TROUBLE NOW, MR. JONES"

MR. JONES: "It certainly does have its voice back."

SERVICE SALESMAN: "Sure, we put in that new oil-proof, neoprene covered wire. Oil and heat won't rot *that* installation. Better let me put neoprene-jacketed cable on your ignition system, too."

IT doesn't take the service man long to find out the difference between quality products and not-so-good products. And hundreds of service men are telling their customers that neoprene-jacketed wire is quality wire. They know that neoprene jackets have all the strength and elasticity of rubber, yet aren't affected by oils, heat, air or ozone. This improved jacketing protects the electrical insulation from these enemies of rubber . . . keeps the current in the wire . . . prevents leaks and power loss. Be sure to meet this coming quality demand by adopting neoprene-jacketed cable *now* for the ignition system. And be sure to specify neoprene wire for the horn connection. Let neoprene help you make better products and better business.

Ask your supplier for
NEOPRENE
JACKETED WIRE
. . .
OR WRITE US FOR A LIST OF MANUFACTURERS

DU PONT

E. I. DU PONT DE NEMOURS & CO., INC., RUBBER CHEMICALS DIVISION, WILMINGTON, DELAWARE

with STANDARD OIL COMPANY'S

ACME CUTTING OIL

drills now last 5 times longer

at auto parts plant

"Drills on that job aren't lasting long enough to be reground."

That complaint from an auto parts manufacturer set a Standard Lubrication Engineer looking for the cause of the trouble. He found it, and following his recommendations, drill breakage was entirely eliminated. Drills can now be reground every five hours and every inch of useful tool life utilized.

This particular job was the drilling of 1/16 and 1/8 inch holes in 3/16 brass rods, and countersinking and spinning the edges of the holes with a flat, 3-step drill. The Standard Engineer found that at 5,000 R.P.M. the drills only ran 15 minutes to an hour before seizing and breaking in the stock. Even with a mixture of light paraffin oil and lard, only fair results had been secured, and the cost of this mixture was away out of line.

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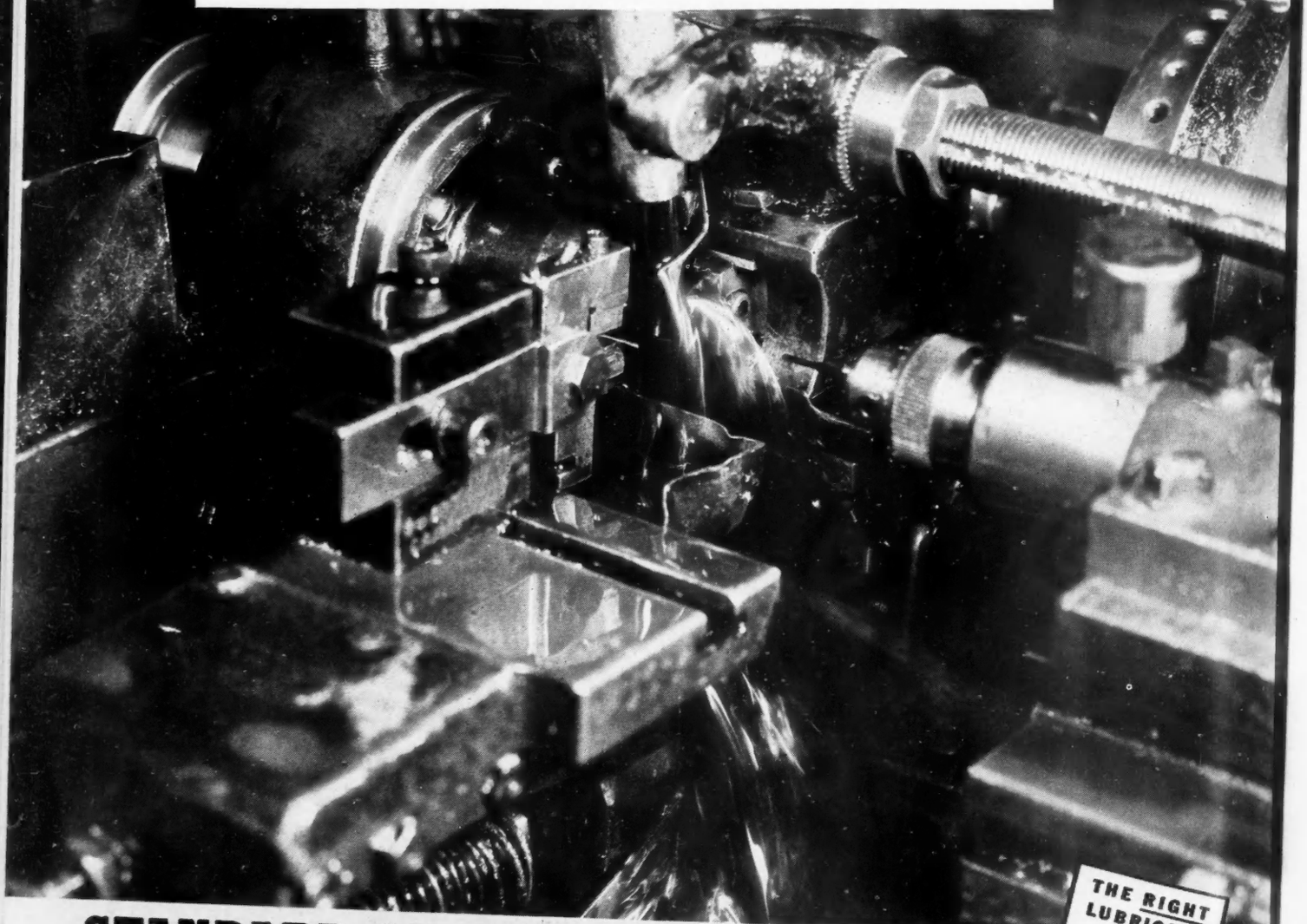
Don't let any metal cutting or grinding problem bother you for a minute. Put it up to your Standard Lubrication Engineer. He'll help you find the answer and it won't cost you a cent. You can reach him at the nearest Standard Oil (Indiana) office or by writing 910 S. Michigan Ave., Chicago, Illinois.

Copr. 1938, Standard Oil Co.



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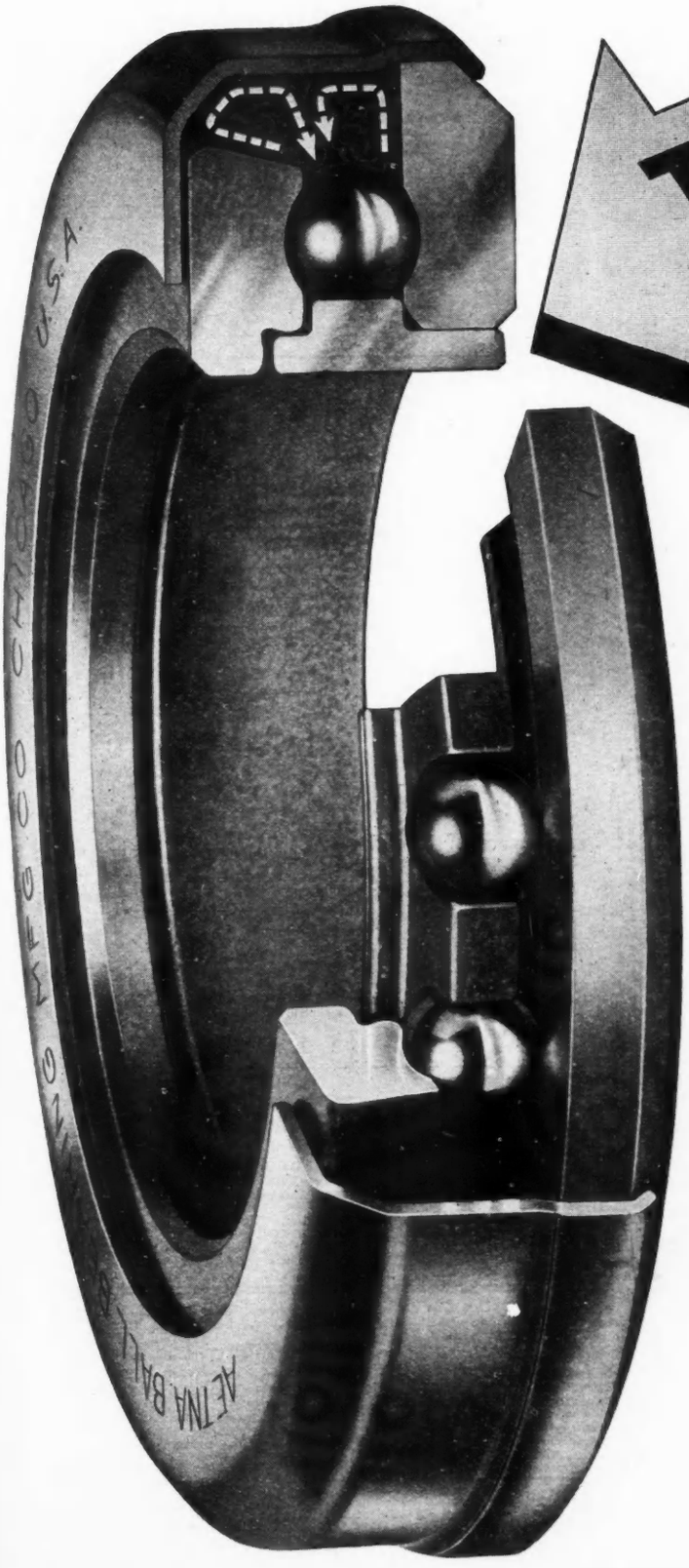

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Silence, long-life, carefree operation . . . These are the qualities you want in every working part of your cars and trucks. Particularly in the parts of hard-to-get-at assemblies where failures may cause costly repair bills and sales-reflecting complaints.

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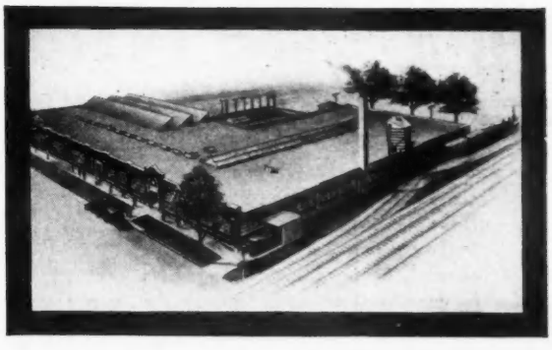
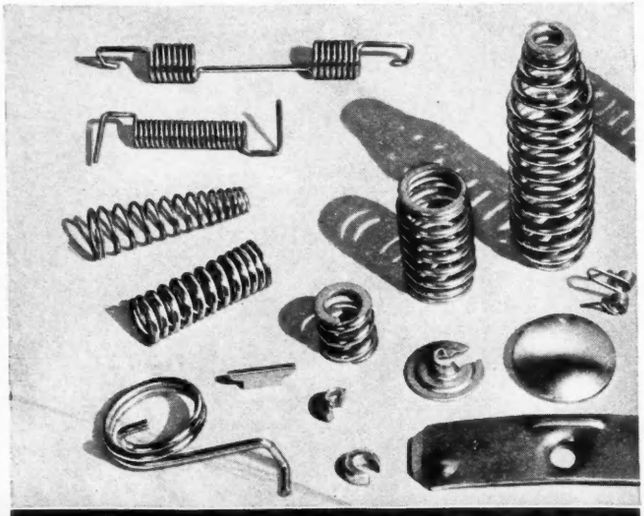
Added space and facilities at the Aetna Plant assure prompt service to all users, large or small.



Aetna "T" Type CLUTCH RELEASE BEARINGS

THE "T" TAMES TROUBLE

"It is a Raymond policy to investigate new materials and methods which appear to promise improved spring performance"



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DAYTON, OHIO

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Reg. U. S. Pat. Off.
Published Weekly

Volume 79 Number 9

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AUTOMOTIVE INDUSTRIES

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August 27, 1938

Production

Field Reports Optimistic As New Model Assemblies Get Underway

Car and truck production figures for the week ending Aug. 27 do not present a true picture of the current activity in the automobile industry as all but two manufacturers had finished production of 1938 passenger cars and were concentrating on preparations for their 1939 models. It was expected that the week would see the finish of all 1938 assemblies except for fragmentary completion of schedules.

The more accurate picture was presented by progress toward getting new models under way and by the continued optimistic reports from the field which indicate the cleanups will be virtually unprecedented and that an actual temporary car shortage will exist in some markets. The week's production estimate includes some 1939 models as two producers got their final assembly lines under way although it will be several weeks before the new cars begin running through without the delays usually encountered at the start.

The industry also should begin the new model season in a healthy condition from the used car inventory standpoint. According to A. N. Benson, general manager of the National Automobile Dealers Association, used car prices are showing a tendency to remain stationary this month instead of declining, which is contrary to the usual seasonal trend.

"This year," he said, "with the new car and truck sales off approximately 50 per cent from last year, automobile dealers had handled only half as many trade-ins as they did a year ago. At the same time used car sales have held up somewhat better with a reduction in volume of around 33 per cent from a year ago. These two factors combined are believed largely responsible for the present stability in used car values."

Total final assemblies of cars and trucks for the week should aggregate about 12,900 units, a preliminary survey of factory schedules discloses. Of this, around 2000 represent first of the 1939 models by two producers already under way and the balance represents practically the last of 1938 model production. Ford and Hudson were the principal contributors to the 1938 model totals for the week and both of these producers were expected to be near the end of their schedules on these models.—J. A. L.

AUTOMOTIVE INDUSTRIES

Summary of Automotive Production Activity
(Week Ending Aug. 27)

BUSES Manufacturing activity continues in general at half capacity rate. Outlook sentiment indicates continuance of present pace for some time.

TRUCKS Autumn business prospects held to be encouraging, although reports of current operations reveal no particular change from last week. One company's orders dominated by lighter trucks.

TRACTORS No appreciable shift in activity from that which has characterized schedules of past several weeks.

AUTOMOBILES All 1938 assemblies dribbled to nearly nil this week, as additional producers swung into new model production. Field reports indicate that cleanups will be virtually unprecedented and that actual temporary car shortage will exist in some markets.

MARINE ENGINES Substantial accumulation of orders during two weeks' shutdown enabled one company to start moving again at a lively tempo. Some foreign orders for Diesel jobs received by this same manufacturer.

AIRCRAFT ENGINES Fears that there would be a slump in engine output have proved groundless. The two major manufacturers are working on three eight-hour shifts a day, in spite of no new large orders in recent weeks.

This summary is based on confidential information of current actual production rates from leading producers in each field covered. Staff members in Detroit, Chicago, New York and Philadelphia collect the basic information, in all cases from official factory sources.

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GM Report Compares '38 Sales, Earnings, Employment, Wages

A review of General Motors business for the first six months of 1938, sent to employes this week, points out that sales volume and the company's earnings declined far more severely than employment and weekly wages.

Dollar sales of General Motors products in the first six months of this year were 38 per cent less than for the same period in 1937, and the company's earnings were 70 per cent less, according to charts reproduced in the review. The average employment, however, was down only 27 per cent for the same comparable period, and weekly pay checks were 25 per cent less. The last percentage figure is for the second quarter only, because temporary stoppages of work early last year prevented comparison which included the first quarter.

Though the hourly wage rates paid were the highest in the history of the company, average weekly earnings were lower than last year, due to the shorter work week. This shorter week, however, helped to provide a greater number of jobs.

The bulletin to employes points out that two out of every five jobs in General Motors have been made possible by surplus.

Berle Wants Planned Output

"Inherently Necessary" for Motor Industry, Oil, and Possibly Copper, Assistant Secretary of State Tells Economic Committee

Planned output in the motor industry is declared "inherently necessary" by A. A. Berle, Jr., Assistant Secretary of State, in a "confidential" and outspoken report to the National Economic (monopoly) Committee. Joined in this category of planned production is oil, and "possibly" copper, for which, Mr. Berle says, some sort of controlled cartel formation or other organization is essential. This proposal is projected as Mr. Berle presents what he calls the beneficial side of regulation in contrast with previously expressed objections to regulation, which he declares is always inherently dangerous. He makes a distinction between the different kinds of business, and while condemning regulation in some fields insists there are certain fields including the motor industry, in which the country is not prepared either for monopoly or for public ownership, but in which planning is essential to secure economy.

"For instance," says Mr. Berle, "the motor industry in 1937 undertook largely to increase its output and sales. It did this at the cost of suspending much of its activities in 1938 and causing widespread distress in the Detroit and Ohio areas. Had any one of the companies undertaken unilaterally to limit its output, a competing company might—and probably would—have increased its output. Had the four major companies entered an agreement to plan their output, they would have been liable to criminal indictment. Yet commonsense would indicate some planning of output in the motors field; just as it does in the mining of crude oil. The market can be estimated; the need is approximately known; a mere senseless over-stocking and shutting down accomplishes nothing."

In suggesting that there should be ascertained the precise contribution or subsidy which the Government now makes to existing business, Mr. Berle goes into the matter of highway funds for building roads and refers to them as "collateral subsidies not readily apparent." The automobile market, he declares, would cease to exist if the local state and Federal Governments stopped providing roads.

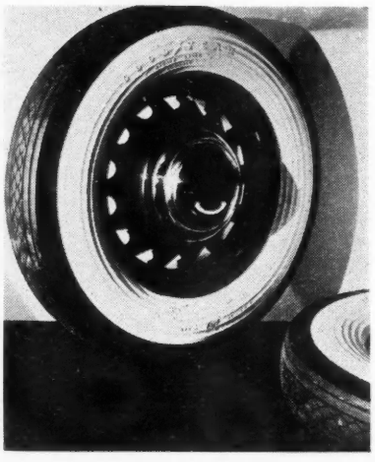
"Certainly," he points out, "the expansion of roads and road improvement has had to go hand in hand with the expansion of the automobile industry. When road expansion stops, the automobile industry will run into a saturation point within a very short time."

The proposed subsidy study is recommended in order to learn "how much of the cost of production, including in that figure the cost of maintaining the necessary labor and obtaining the necessary market, has been loaded off on the community by the enterprise."

"Relief to workers in time of layoff is a subsidy to industry," declares Mr. Berle.

"General Motors, for instance, pays an average annual wage of approximately $1,100 a year," says the report. "When plants are running full this about takes care of the worker. When the plants shut down or lay off, men who are unable to save on this wage go on to the relief rolls. If this were classified as a cost of General Motors, there might be a different picture of the extent to which General Motors depends on the government for its profits. It will come as a shock to the public to learn that unemployment relief is essentially a subsidy; but I see no escape from the underlying economics of it."

Mr. Berle also wants a study made as to whether the net result of research laboratories is not to stifle inventions, once they are made, quite as much as to cause actual invention. At present, he declares, a very large number of inventions are made in research laboratories of large corporations. There is said to be no knowledge as to how many of them are used, "and, of course, no guide at all as to what would happen were these inventions open to exploitation by any group other than the corporation developing them." Mr. Berle contends that "it is at least conceivable that equality of access to all technical improvements might be granted on standard terms. Every invention could be made available to every one who desires to use it, provided the same royalty payment is made."



AN ACCESSORY and not a unit in itself is the conception of an automobile tire held by Henry Dreyfuss who designed the one pictured above for the Goodyear Tire & Rubber Co. "In designing this new tire," says Mr. Dreyfuss, "we took the simple, functional shape of the wheel and moulded, in light and shadow, a design which follows the very function of the wheel . . . We worked in clay and the design was developed as a sculptor develops a figure — every depression meant so much contrast in shadow; every raised point so much reflection of light . . . It is designed to complement the automobile of which it is an essential and integral part."

Labor

UAW Dissension May Bring About Organizd Labor Realignment

The bitter squabble which continues to rage between rival factions in the ranks of the United Automobile Workers Union of America has reached the stage where it may play an important part in the complete realignment of the forces of organized labor in the United States.

That is the opinion of observers who are reading between the lines of the day-to-day news reports of the activities of the disputing factions. They also see in the latest activities of both sides a desperate attempt to achieve victory before the UAW disintegrates completely or is definitely divided into two separate unions with resultant chaos in the status of agreements in effect between manufacturers and the original UAW.

Followers of the five officers deposed by President Homer A. Martin are pinning their hopes on intervention by John L. Lewis, CIO chieftan, who has been asked to appoint an administrator for the UAW, to supersede Martin, and the calling of a special convention by the administrator for the election of a completely new slate of administrative officers. A special meeting of the anti-Martin forces, with representatives claiming to speak for 224,000 members, passed resolutions on Aug. 18 in Toledo urging Lewis to appoint an administrator. Lewis was expected to confer with delegates from the Toledo meeting in Washington this week and his decision, either way, was expected to play an

important part in the future history of the UAW if not the entire CIO.

Although deprecated by Martin supporters it is reported that appointment of an administrator would result in the entire Martin camp's moving into the AFL while failure to appoint an administrator or some other action that would clip Martin's wings would also result in permanent division of the present UAW into two rival organizations.

Meanwhile the charges of Communistic influences exchanged between both sides had reached Washington, where it was reported this week that the House Committee, headed by Rep. Martin Dies of Texas, which is investigating un-American activities, would send a sub-committee to Detroit to look into the reported activities of Communists in the UAW.

UAW headquarters, which continue to be controlled by the Martin administration, have denied that the squabble has resulted in a loss of membership and a shrinkage of income from dues although statements issued by rival leaders in the heat of battle would seem to bear out the fact that members have dropped out or have ceased to pay dues in protest against the struggle for leadership.

Approves Sale of Cord Parts and Equipment for $45,000

Approval of the sale of Cord parts, assemblies, tools, dies, and patterns of the Auburn Automobile Co. plant at Connersville, Ind., to Norman DeVaux, Detroit, for $45,000 has been granted by Federal Judge Thomas W. Slick, South Bend. The Auburn company filed petition of bankruptcy in United States District Court, Fort Wayne division, Dec. 11, 1937.

40 Years Ago

with the ancestors of AUTOMOTIVE INDUSTRIES

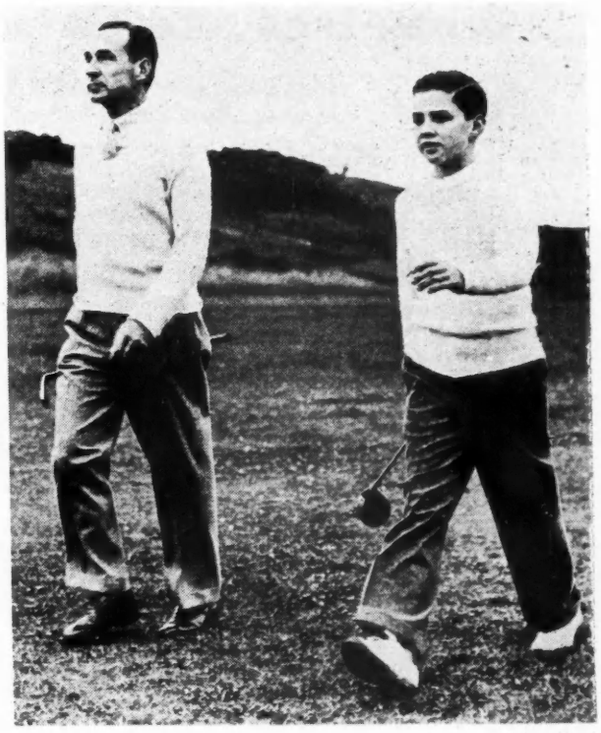
Minor Mention

Randolph & Clowes, of Waterbury, Conn., are the makers of an acetylene lamp that motor carriage builders find is just what they need for carriage lamps. It gives nearly 100 candle power, and the light is of beautiful purity and softness.

From *The Horseless Age*, August, 1898.

FORDS AFOOT—

Edsel Ford and son William caught by the camera on the golf links at Gleneagles, Scotland, during the vacation they spent recently at the Scottish resort.



International

Warner Gear Improves Overdrive

Unit for 1939 Automobiles Now Has Self-Contained and Independent "Force-Back" Mechanism

Characterized by engineers as an outstandingly important development is the improved overdrive offered by the Warner Gear Division, Borg-Warner Corp., for 1939 motor cars. Of especial interest in this unit is the system of controls which provide the car driver with an easy and natural means of forcing from overdrive back to direct, at will. This feature overcomes the principal objection to conventional overdrives, namely, the inability, heretofore, of getting out of overdrive without actually slowing the vehicle below the cut-out speed in critical operating situations.

With the new overdrive, driver control is achieved simply by pressing the accelerator pedal a little beyond the normally wide-open position. This is a natural maneuver since the driver usually wants to get back into direct at a time when he already has the throttle wide open. When forced into direct, the transmission will remain there for a considerable range of pedal movement, so long as the accelerator is not released sufficiently to permit of torque reversal. While in direct, under these circumstances, if the foot is lifted off the pedal, with the car speed above overdrive cut-in speed, the transmission automatically returns to overdrive.

From the standpoint of design, the original overdrive remains substantially unchanged. The improvement in operation has been achieved by the introduction of a self-contained and independent "force-back" mechanism contained in an intermediate mounting bracket which is installed between the main transmission and the overdrive housing.

Recalling the original overdrive design, described in AUTOMOTIVE INDUSTRIES some time ago, it may be noted that on the new unit the forward end of the sun gear for the planetary overdrive train is carried in a circular member having large notches or slots in its periphery. Engaging one of these slots is a non-rotating pawl carried in the intermediate mounting member. When this pawl is in one of the slots (normal position), the sun gear cannot rotate and overdrive is secured by a centrifugal clutch as before. If while the transmission is in overdrive, the pawl is withdrawn, the sun gear becomes free to rotate and the transmission drives in direct although the centrifugal clutch parts remain in overdrive position

(Turn to page 250, please)

Ourselves and Government

A weekly check list of legislative, executive and judicial actions affecting the automotive industries. First appeared in June 25 issue, p. 831. Corrected to Aug. 25

CONGRESS

Adjourned June 16, sine die. All members of House and 36 Senators retire or face election in Autumn.

Legislative Legacies

MONOPOLY INVESTIGATION. The 12-member National Economic Committee is scheduled to issue subpoenas to business firms soon for production records, books, correspondence and additional information desired by the six Government departments participating in the inquiry. Steel, oil and insurance companies may be named in the first subpoenas. Dates for public hearings expected to be announced after Labor Day, at which time subpoenas for individuals may be issued.

WAGES & HOURS. Administrator Elmer F. Andrews is currently negotiating with the textile industry for the establishment of minimum wages and maximum hours. Conferences with the tobacco and garment industries expected to follow. Law becomes effective Oct. 24. Andrews has been favorably received in Washington and his appointment has prompted reports the law will be administered with a minimum of ballyhoo, and crackdown technique.

AIRLINES. The new five-man Civil Aeronautics Authority on Monday formally took control of all non-military aviation activities when the McCarran bill, (S. 3845) recently passed by Congress, became effective. A White House executive order on Tuesday transferred to the new agency 3000 employes of the Bureau of Air Commerce and 100 from the ICC's Airmail Division. Col. Sumpter Smith, former WPA airways director, and Thomas O. Hardin, former vice-president of the National Airline Pilots Association, were sworn in on Monday as members of the three-man Air Safety Board. The five members of the CAA took the oath of office last week. One of the CAA's first jobs is to study the country's airport systems, on which a report is due in Congress next February. To date, the Authority has extended to several airlines the time limits for filing schedules, and has authorized the continuation of three existing air transportation services pending approval of applications for certificates of convenience and necessity.

DEPARTMENT OF JUSTICE

MONOPOLY. Status unchanged since report in AUTOMOTIVE INDUSTRIES issue of Aug. 13.

DEPARTMENT OF LABOR

AIRCRAFT LABOR. Public contracts board has withdrawn recommendations to fix a 60-cents-an-hour minimum wage rate for workers in the aircraft manufacturing industry pending a supplementary public hearing scheduled for Sept. 8 in Washington.

CONTRACTS. Public Contracts Board announced contracts totaling $1,108,962.60 for transportation equipment as reported by five Government Departments during the week ended Aug. 18. Largest single contract went to the Douglas Aircraft Co., Inc., Santa Monica, Cal., and amounted to $793,000 for aircraft and parts. Steuart Motor Co., Washington, D. C., was next with a $99,147.56 contract for supplying the WPA with Ford trucks. Sperry Gyroscope Co., Inc., Brooklyn, N. Y., a $59,500 contract for supplying aircraft pilot devices to the Navy Department. Among other companies receiving contracts were: the Wright Aeronautical Corp., Paterson, N. J., $54,597.36, aircraft engines for the Treasury; International Harvester Co., Inc., Springfield, Ohio, $54,092.50, trucks for the Farm Security Administration.

STEEL LABOR. After hearings July 25-26 on SWOC demand that minimum common labor rates per hour in steel industry be fixed at 62½, 60 and 45c. in the east, west and south, respectively, the Board set Aug. 8 as the deadline for filing wage data and Aug. 22, for filing briefs. Final action not expected before late September and may apply to Ford steel plants. Board eventually plans to cover all industries doing Government business, including the automobile industry, although it may be among the last to be considered.

LABOR RELATIONS CASES

NLRB vs. FORD. Trial Examiner R. N. Denham in tentative report recommends that Ford reinstate 400 strikers at Long Beach, Calif., assembly plant, grant exclusive bargaining power to UAW and withdraw recognition from the unaffiliated Independent Auto Workers as a bargaining agency and disestablish latter.

FEDERAL TRADE COMMISSION

INVESTIGATION under the Withrow-Minton Resolution (M. J. Res. 351), Status remains unchanged since report in AUTOMOTIVE INDUSTRIES issue of Aug. 13.

F.O.B. PRICES case vs. G.M. and Ford. Date for hearing originally expected to be fixed for some time in August, now expected to be set for after Labor Day. Complaint alleges advertising misleading because prices do not include standard equipment.

VS. GENERAL MOTORS on question of forcing dealers to purchase parts and accessories from G.M. sources only. Hearings were resumed in New York on Aug. 16. Everett Haycraft is FTC attorney in charge.

SIX PER CENT CASE. F.T.C. cited Ford and General Motors in July, 1937, complaining of false and misleading representations in advertising prices of automobiles. Complaint alleges advertising 6 per cent charge on deferred payments by retail purchasers is misrepresentation because no provision is made for amortization. Case now in hands of trial examiner.

FAIR TRADE PRACTICE rules for retail automobile dealers, introduced at public hearings during last NADA meeting in Detroit (see A.I., April 30, 1938), are still under study by the FTC fair trade practice division headed by George McCorkle.

INTERSTATE COMMERCE COMMISSION

Effective Oct. 1, the ICC has prescribed a maximum driving day of 10 hours to be followed by an 8-hour off-duty or rest period, or a weekly limitation of 60 hours on duty, for truck and bus drivers of common and contract motor carriers. The Public Health Service has been directed to conduct studies covering the fatigue problem, and the ICC Motor Carriers Bureau will make further studies of accident reports "for the light they may throw on the effects of safety of operation of different periods of duty."

TREASURY DEPARTMENT

Showing sharp declines, Internal Revenue collections of excise taxes on automobiles and motor cycles in July of the present year were $3,558,074.37 compared to $4,048,131.54 in July, 1937; on automobile parts and accessories collections dropped to $671,527.90 from $678,334.24; taxes on tires declined to $1,957,658.96 from $3,374,350.86; taxes on inner tubes decreased to $469,531.74 from $598,257.76; taxes on lubricating oils rose slightly to $4,784,067.44 from $4,371,623.50; taxes on gasoline dropped to $16,264,420.73 from $19,590,748.83 and taxes on automobile trucks fell to $489,295.05 from $814,461.79.

Checkoff System and Closed Shop at Fisher Body Sought by UAW

Revision of the present contract to provide for adoption of the check-off system and the closed shop will be demanded in the new production season in plants of the Fisher Body division of G.M., it was announced this week at UAW headquarters after a three-day conference between representatives of Fisher locals and the union's G.M. department heads. Under the agreement either side may serve 60-day notice of desired exchanges.

Other demands to be made included elimination of piece work, prevention of supervision working on production, elimination of loss or seniority after 12-month layoff, seniority on departmental rather than plant basis, recognition of shop steward system, greater elasticity in time allowed for grievance adjustment, mutual agreement between union and management on time studies and resultant standards, and permission to plant guards to join union but to be represented in grievances only through their own committees.

A strike at the Detroit and Wyandotte plants of the McCord Radiator & Mfg. Co., in which the UAW charges transfer of machinery and work to another plant in Ohio was still under way this week with negotiations for a settlement apparently at a standstill. Because of the strike, Homer Martin, UAW president, has warned Allis-Chalmers, Studebaker, Packard and Hudson that UAW members will not work on the company's radiators. In opposition to the strike, numbers of the company's employes have been organizing a back to work movement which resulted in a brief skirmish with pickets at the Wyandotte plant on Aug. 24.

Five Starters Set for Detroit Gold Cup Regatta

A three-day racing program, climaxed by three 30 mile heats for the Gold Cup Championships, has been arranged for Detroit's annual Labor Day regatta series on the Detroit River. All of the events are for inboard craft, including 225 cu. in. hydroplanes, runabouts and cruisers.

The thirty-fifth running of the Gold Cup will take place on Labor

Day afternoon. At least five starters, all of them potential 90-mile-an-hour boats, are assured for the classic, and added entries may swell the field to eight or nine craft at race time.

The prospective field for the championships follows (boat name, owner and driver): Notre Dame, Herb Mendelson, Clel Perry; Miss Canada III, E. A. Wilson, Harold Wilson; My Sin, Zalmon Simmons, Arno Apel; Alagi, Count Theo. Rossi, Rossi; Pardonnez - Moi, Horace Dodge, (unnamed).

Club affiliations: Mendelson, Detroit Yacht Club; Wilson, Muskoka Lakes Association, (Canada); Simmons, Absecon Island Y. C., Atlantic City, N. J.; Rossi, Oakland (Calif.) Y. C.; Dodge, Detroit Yacht Club.

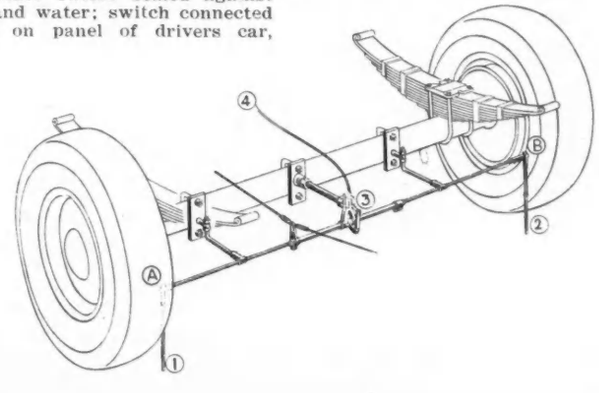
Possible added starters are: Juno, J. M. L. Rutherford, Palm Beach Yacht Club; El Lagarto, George Reis, Lake George (N. Y) Club; Delphine IX, Horace Dodge, Detroit Yacht Club.

New Trailer Safety Signal

The Michigan Automotive Development Co., Detroit, has announced a new trailer accessory—the Testori Trailer Safety Signal, an invention of John Testori, president of the company. It is a simple device, consisting of two nickel-plated, rust-proofed rods extending toward the pavement between the wheels of the trailer axle, firmly attached to the axle by plates and U-bolts. It fits any pleasure or commercial trailer, being adjustable in width between the limits of 50 and 60 in. The ground contact rods are mobile and held in place by compression springs. The contact rods are set according to the size of wheels and tires, generally from ½ to 1 in. from the ground. The instant a tire lowers ½ in., the rod contacts the pavement, turning on its swivel joint and making a contact with a specially enclosed switch. The latter is fixed to a cross rod and connected with a buzzer in the power car through a waterproof contact cord.

The flexible swivel joint allows the driver to back up to travel over rough detours or rutty country roads without damage to the signal.

TRAILER SAFETY SIGNAL 1 and 2—Ground Contact nickelplated rust proof rods, adjustable to varying sizes of tires and wheels, fitted with steel compressed springs; 3—special compression spring contact switch sealed against dust, oil, and water; switch connected to buzzer on panel of drivers car, through strong waterproofed cord; 4—Rod between (A) and (B) adjustable to any width of axle (50 to 60 in.) strongly supported by U-bolts and held in place by resilient springs; ground contact rods connected to cross rod by special flexible swivel joints (A and B).



Boat and Marine Engine Exports Up 10 Per Cent in 1938

Exports of American motor boats and marine engines increased in value by more than 10 per cent for the first six months of 1938, according to Department of Commerce statistics. The volume of foreign trade for the first half of the year totaled $2,030,048, compared with $1,815,088 for the same period of 1937.

Canada was the chief market for both boats and marine engines, with Venezuela and France following next in order. The exports went to 57 different countries during the six-month period.

Buick Sales Higher Than Seasonal Rate

Sales of Buick motor cars thus far in August has maintained the higher than seasonal rate experienced during the past month, according to W. F. Hufstader, general sales manager.

Domestic retail sales of Buick cars during the first 10 days of August was 3175, he said, comparing favorably with those of the corresponding period of last month, when 3394 cars were sold.

At the same time Buick deliveries in the United States showed an increase in used car sales as compared with July. Used car sales for the first 10 days of August totaled 8700 as against 8375 in the corresponding July period.

Advertising News Notes

Pontiac Motor Co. has appointed an advisory committee of dealers to help form advertising plans for the coming model year. The committee consists of H. A. Wehmeier, Chicago; A. D. Sory, Houston; C. P. Brady, Pittsburgh; Clair Savage, Los Angeles; Harold Wright, Elizabeth, N. J.; George M. Thompson, Springfield, Mo., and Claude Nolan, Miami, Fla.

Marketing will play an important role at the International Management Congress, Sept. 19 to 23. The congress opens in Washington, under the chairmanship of W. L. Batt, president, SKF Industries, Philadelphia. Important world figures in advertising will present many phases of merchandising during the event.

Hoof Products Co., Chicago, manufacturer of Hoof Cantilever governors, has appointed Van Auken-Ragland, Inc., Chicago to handle its advertising. Three new automotive safety items will be announced in October.

Ken Barber, formerly secretary and account executive of the Buchen Co., Chicago, has joined Lyle T. Johnston Co., Chicago. He will be in charge of the agency's farm and industrial division.

"Professor Quiz," the Nash-Kelvinator half-hour Saturday evening program over 33 Columbia stations, has advertising circles in a dither. The contract has not yet been renewed, although the dead-line is approaching. It is considered to have a valuable dealer hook-up, as the question blanks, for all and sundry to pose sticklers, is available at Nash-Kelvinator dealers. Rumors of another sponsor, a change in time, and more stations, are rife.

New arrangements for play-by-play coverage of Saturday afternoon football games have been completed by Atlantic Refining Co. through N. W. Ayer & Son, Philadelphia. The series starts Sept. 24, over Columbia Broadcasting stations in New England.

Stephenson Wells has joined the staff of M. Glen Miller, advertising agency of Chicago, as an account executive.

The Ford Sunday Evening Hour will inaugurate its fifth season of symphony programs on Sunday, Sept. 11, when the first of the new series will be aired from Detroit's Masonic Temple Auditorium over the coast-to-coast Columbia network at 8.00 p. m. EST (9.00 p. m. EDST).

Grace & Bement, Inc., is now working on initial copy which will launch a substantial advertising program for Hupp Motor Car Corp. The company has done little advertising since early last winter, following the announcement of the 1938 models.

Delco is planning a fall drive to get at least 10 per cent of the country's replacement battery business, it was disclosed this week at the annual convention of United Motors Service distributors, in New York. Campbell-Ewald Co., Detroit, is handling the campaign.

Arthur M. Semones, vice-president and general sales manager of the Lane Co., Altavista, Virginia, returned this week to Henri, Hurst & McDonald, Inc., where he will again devote his time to merchandising problems.

BUSINESS IN BRIEF

Written by the Guaranty Trust Co., New York

Reports from several sections of the country last week indicate continued industrial improvement, and the belief is growing that earlier predictions of an upward trend gaining in momentum in the autumn appear to be more and more warranted as time passes. The index of business activity compiled by the *Journal of Commerce* stood at 77.7 last week, as compared with 75.4 the week before and 102.6 a year ago. All components of the index showed substantial gains excepting steel operations.

Residential building contracts awarded during July were 8.5 per cent above those in the corresponding period last year, according to the F. W. Dodge Corp. Reports from Washington indicate that applications for insured mortgages increased last week contrary to the usual seasonal movement.

Railway freight loadings during the week ended Aug. 13 totaled 589,561 cars, which marks an increase of 5511 cars above those in the preceding week, a decrease of 184,221 cars below those a year ago, and a drop of 147,017 cars below those two years ago.

Retail food costs during the month ended July 12 declined 0.2 per cent. Prices of meat and eggs advanced, but this rise was more than offset by a decline of 7.6 per cent in the prices of fresh fruits and vegetables. Changes in other commodity groups were relatively small.

Production of electricity by the electric light and power industry during the week ended Aug. 13 was 7.3 per cent below that in the corresponding period last year.

Store chain sales in July extended the gains made in June, with nearly all branches sharing in the improvement. The index compiled by the *Chain Store Age* stood at 108.2 per cent of the 1929-31 average for July, as compared with 106.3 for June and 114.5 a year ago.

Production of lumber during the week ended Aug. 6 stood at 63 per cent of the 1929 weekly average. Reported output was nearly as large as that in the preceding week, in which it was the highest for the year. Shipments were slightly below the preceding 1938 peak week, while new orders rose.

Professor Fisher's index of wholesale commodity prices for the week ended Aug. 20 stood at 79.9, as compared with 80.2 the week before and 81.0 two weeks before.

The consolidated statement of the Federal Reserve banks for the week ended Aug. 17 showed no changes in holdings of discounted bills, Government securities, and bills bought in the open market. Money in circulation and the monetary gold stock both increased $19,000,000.

Automotive News from Nippon

Honda Guides Piston Ring Manufacture

A new factory has been completed in Osaka for the manufacture of automobile and aircraft piston rings. It is said that Dr. Kotaro Honda, renowned metallurgist of Sendai Imperial University, assisted in the design of the plant.

Ford Japan Pays Bonus to Idle Salesmen

The Ford Motor Co. of Japan is reportedly paying bonuses to salesmen of authorized Ford dealers for cars they haven't sold. Under present operating conditions of Japanese branch plants of American motor firms the Army has practically an option on the entire car output, leaving but few vehicles for the open market. Salesmen are thus condemned to idleness and have threatened to seek other jobs. Both Ford and GM have invested a good deal of time and money in drilling Japanese salesmen in the art of motor salesmanship, and to protect this investment against the day when cars will be again available for civilian use, the Ford Motor Co. of Japan is paying the bonus to those salesmen who stick to their jobs.

Army Buys "Sanrinsha"

It is learned that the Army has placed an order for 500 "sanrinsha," the Japanese three-wheel motor carriers. This order came as an agreeable surprise to manufacturers of "sanrinsha," inasmuch as the Army so far has taken the stand that these vehicles are unfit for military use and that their production should be discouraged. It is explained that the rear line of transportation in the war zone has greatly expanded of late, necessitating mobilization of all sorts of conveyance means. It is reported that a few experimental vehicles have proved of great value directly behind the firing front.

Japanese Motor Parts for Detroit?

It is reported that the Nippon Tanko Kaisha (Japan Forging Co.), which recently completed a 1,000,000 yen plant at Kawasaki, has secured an understanding from the Ford Motor Co. of Japan that the latter will use Nippon's forged parts not only in Japanese assembly operations, but that also the American parent firm will use a certain amount of these parts.

Mr. S. Kaji, Nippon Tanko's business manager, recently visited the United States to purchase the necessary machinery. It is said the Ford Motor Co. arranged for his inspecting all major Ford subcontracting shops.

GM Calls Off Summer Vacations

In response to an official request to import more parts for assembly of Chevrolet cars and trucks, the Osaka head office of General Motors (Japan), Ltd., called off August and September vacations.

A Gallon a Day

Under Japan's fuel rationing system, a private passenger car now obtains no more than a gallon of gas a day; a small truck, 1.35 gallons; a large truck, 5.65 gallons; and a taxi, 4.8 gallons.

Mitsui to Boost Toyota?

It is reported that the powerful Mitsui interests may give active assistance to the Toyota Automobile Company, which has been practically squeezed out of the market by the powerful Nissan-Tokyo Jidosha combine. Mitsui controls already a large packet of Toyota shares.

Fiats to Japan

In anticipation of the large orders for Fiat cars to which Italy is entitled under the Italo-Japanese-Manchukuoan trade pact, Fiat's Far Eastern representative, Mr. Cavari, has already moved his head office

from Shanghai to Tokyo. First shipments of Fiat cars are expected to arrive in Japan some time in September. Under the trade pact, Japan and Manchukuo are obliged to take 24,000,000 lire worth of Italian automobiles in exchange for Manchurian produce.

Polk Reports August Gain In New Car Registration

Early reports on new passenger car registrations in the United States in August show sales for the first 11 days to be 7.4 per cent below those for the same period in July, according to R. L. Polk & Co.

In the Pacific Coast region, comprising Oregon, California and Washington, sales activity is considerably greater than for the country as a whole, with registrations for the first 11 days of August running 5 per cent ahead of those in the same period of July.

Activity is above the national average also in the Mountain region (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah and Wyoming) according to Polk tabulations. Early August returns show a 3.1 per cent gain over July.

Registrations in other sections of the country in the first third of August are below corresponding July records as follows: Middle Atlantic States, 10.4 per cent; East North Central, 6.6; West North Central, 16.7; South Atlantic, 8; East South Central, 3.9, and West South Central, 20.

Goodrich Reports $209,551 Loss For First Six Months of 1938

Sales of the B. F. Goodrich Co. for the first half of 1938 were $51,913,986 campared with $78,566,619 in the same period of 1937. The 1938 period produced a net loss of $209,551 after depreciation, interest and taxes, compared with a net profit of $3,510,698 in the first half of 1937. Goodrich is one of the major suppliers of the original equipment tire market and felt severely the car industry's curtailed production schedule.

As of June 30, 1938, current assets amounted to $73,485,256 and current liabilities were $12,613,780. Inventories were valued at the lower of cost or market and raw material commitments were at prices below market, it was stated. Domestic bank loans amounted to $3,500,000 at June 30, 1938. The accounts for the half year period, as is customary, were prepared by the company's accounting staff.

Automotive Metal Markets

Steel Buying by Automotive Industry Encourages View That Higher Operating Rates Will Be Sustained

Steel buying by automobile manufacturers and parts makers gained sufficient momentum this week to bring into sight prospects of a sustained improvement in operating rates following the Labor Day pause. Nearly all orders were for prompt shipment, indicating that most of the steel is intended for use in demonstration cars. All of the steel-making districts shared in the business, much along the same lines as before the basing point upheaval. Besides encouraging orders for flat rolled steel, there was quite a little business placed in hot-rolled, cold-finished and alloy steel bars, bolts and nuts and wire.

The American Iron & Steel Institute's report of employed ingot capacity for this week: 42.8 per cent, the highest in 10 months, was preceded by a release showing that "steel companies incurred an average net loss of $1.75 a ton on products shipped to consumers in the first half of 1938." That the steel industry has been operating in the red during the year's first six months, comes hardly as news, and the Institute's release fails to shed any light on what descriptions of steel were the loss leaders. With the "break even point" having come to be so important an element in the steel price situation, consumers are much more interested in a breakdown of profits or losses on the various classes of finished steel than in an average for all. Such an analysis would reveal from what consuming industries steel producers derive their real support. Theoretically the steel market's structure is presumed to be an entity, moving up and down in unison, but there are some highly finished products, such as many used in the manufacture of automobiles, that naturally permit under normal conditions of more profit per dollar of sales than do heavy steel products for building and railroads. Tool steel sales are tapering off, following a heavy run of business. More activity is noted in single carloads of foundry and malleable irons.

Non-ferrous metals marked time this week. The coppor market was extremely quiet. Fabricators are well supplied for their nearby needs, and for the most part are deferring additional commitments until specifications from their own customers come in more freely than they have so far. Outside holders of electrolytic are virtually asking the same price as producers, 10⅛ cents. Export demand is a shade better, with metal, c.i.f. Liverpool at 10.07 cents.

Tin buying has been very light in the last few days. Spot Straits was quoted at 42⅞ cents at the beginning of the week and this continued to be the nominal price on Tuesday, when the market was virtually idle. Statistically the metal's position is such that, with the Buffer Pool calling for its statutory contributions, prices can move only in one direction, the one for which the Buffer Pool was organized, but consumers are decidedly apathetic and apparently ready to pay higher prices when they have to.—W. C. H.

Modern European Racing Engines

Following are brief specifications of engines of racing cars built to comply with the new international racing rules and regulations:

Make	Cyl. No., Bore and Stroke In.	Displ. per Cylinder Cu. In.	Total Displacement Cu. In.	Stroke-Bore Ratio	Engine Speed r.p.m.	Piston Speed ft. p. m.	H. P.	H. P. per Cu. In.
Alfa Corse	8-2.72 x 3.94	22.8	182.4	1.44	6000	3940	306	1.675
Alfa Corse	12-2.59 x 2.87	15.2	182.5	1.10	6500	3110	330	1.804
Alfa Corse	16-2.29 x 2.75	11.27	180.4	1.20	7000	3210	348	1.90
Auto-Union	12-2.56 x 2.95	15.16	182.0	1.14	6500	3190	...	....
Delahaye*	12-2.95 x 3.33	24.8	274.0	1.12	5000	2780	250	0.91
Maserati	8-2.71 x 3.94	22.8	182.4	1.44	6300	4140	350	1.92
Mercedes	12-2.63 x 2.75	15.0	180.7	1.04	7200	3310	370	2.02

* Without supercharger, which makes the displacement limit 274 cu. in., as compared with 183 cu. in. for supercharged engines.

All of the above makes, with the exception of Auto-Union, took part in the recent Grand Prix of Tripolis, which was won by Lang on a Mercedes. Mercedes cars finished one-two-three in this race (Lang, Brautchitsch, Caracciola); an Alfa driven by Sommers finished fourth, Taruffi on a Maserati fifth, and Dreyfus on a Delahaye sixth.

Davis Heads Hupp

Announces Appointment of DeVaux As General Manager

Election of S. L. Davis to the presidency of the Hupp Motor Car Corp., succeeding Thomas Bradley, resigned, has been announced by the board of directors of the corporation. Davis has been for many years the company's largest distributor and for the last 15 months a member of the board. He announced the appointment of Norman deVaux as general manager in charge of operations and deVaux's election also as a member of the new board.

DeVaux was for many years prominent in the industry on the West Coast. He was founder and president of Chevrolet Motor Co. of California from 1915 to 1922 and later headed Durant Motor Co. of California and Willys-Overland Pacific Co.

Davis confirmed rumors that Hupp had purchased dies, tools, jibs, fixtures and inventory representing an approximate value of more than $1,000,000.

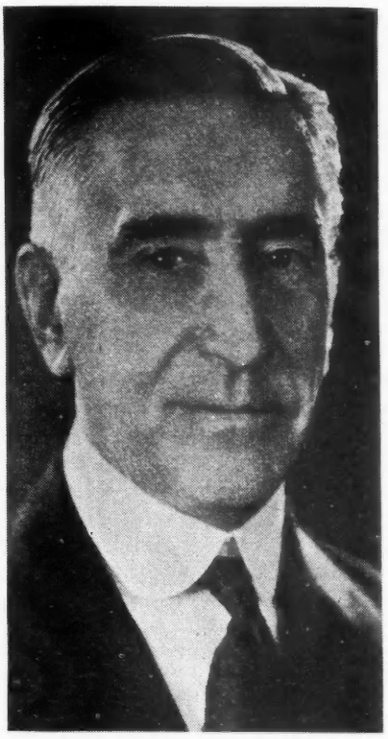
Announcement was made that in addition to its present line of sixes and eights, which will be continued with improvements, the company plans to build two new lines of low-priced cars for 1939 to be introduced this fall.

Davis announced that W. A. MacDonald continues as vice-president in charge of sales. P. L. Louks, formerly assistant secretary, succeeds John L. Cotter as treasurer and as sistant secretary. Edward Rothbart of Chicago, general counsel, was elected secretary. He was recently elected to the board.

The Hupp board now consists of William B. Mayo, J. Walter Drake, and Norman deVaux, of Detroit; J. Scott McIntyre of Cedar Rapids, Iowa; and S. W. Mozley, Edward Rothbart and S. L. Davis of Chicago.

S. L. DAVIS

. . . who has been elected president of the Hupp Motor Car Corp., succeeding Thomas Bradley, resigned. Mr. Davis has been a member of the Hupp board of directors for the past 15 months.



NORMAN DEVAUX

. . . new general manager in charge of operations, Hupp Motor Car Corp. DeVaux is also a member of the new Hupp board of directors.

Quarterly Dividend Declared By Budd Wheel Co.

Budd Wheel Co. has declared the regular quarterly dividend of $1.75 per share plus a participating dividend of 25 cents per share on the preferred stock of the company.

The dividend will be payable Sept. 30 to holders of record at the close of business Sept. 16, 1938.

Apparatus Makers To Award $500 in Contest

A contest with a first prize of $200 in cash has been announced by the industrial instrument section of Scientific Apparatus Makers of America, Chicago.

Twelve prizes, totaling $500, will be awarded by the apparatus makers. The contest is open to any engineer or operating man, not employed by an instrument manufacturer. Each contestant is to write about an unusual application of a standard instrument or control device. By instrument or control device is meant any device used for measurement or control in a plant or laboratory, or any accessory used with a device for measurement and control.

The contest closes Nov. 15, 1938, and the judging will be held during the week of Dec. 5.

July Pneumatic Casing Shipments 2.9 Per Cent Below June

According to statistics released by the Rubber Manufacturers Association, Inc., shipments of pneumatic casings during the month of July, 1938, estimated at 3,947,431 units, show a decrease of 2.9 per cent under shipments made in June. Although July shipments were 23.9 per cent below shipments for July, 1937, pneumatic casings in the hands of manufacturers continued to decline. July 31 inventory is estimated at 8,201,415 units, which is 6.4 per cent under stocks on hand June 30, and 29.6 per cent below stocks on hand July 31, 1937.

The association estimates production of pneumatic casings for July at 3,352,601 units which is the highest month's production since last October and represents an increase of 7.8 per cent above June, but 21.9 per cent below July, 1937.

U. S. Aeronautic Exports Gained 128 Per Cent in First Half

Total exports of aeronautic products from the United States during the first six months of 1938 amounted to $37,121,659, an increase of 128 per cent over the first six months of 1937, according to the Bureau of Foreign and Domestic Commerce. Exports were fairly well distributed throughout the world, Asia and Oceania taking 40 per cent; Europe and Africa 34 per cent; South America 17 per cent and North and Central America 9 per cent. Seven countries, Japan, Argentina, China, U.S.S.R., Netherlands, Indies, Turkey and Canada were the principal customers, taking 74 per cent of the total exports.

MEN OF THE INDUSTRY

WALTER S. PEPER of the Packard Motor Car Co. of New York has been appointed assistant show manager in charge of the Fifth Annual National Motor Truck Show.

L. A. ROSENBERG, formerly New York district operating manager, has been appointed assistant manager of the B. F. Goodrich Co. retail department in Akron, Ohio, and **J. E. DUFFY,** office manager in New York, has been named acting New York district operating manager. **T. E. BLOCH** becomes acting office manager of the New York district.

HARRY C. SPRING, who has been district operating manager for both the Cleveland and Detroit sales divisions of the B. F. Goodrich Co., will devote his entire time to the Detroit area as district operating manager and **A. Y. WILSON,** who has been assistant district operating manager in Cleveland assumes the district operating managership.

LANGBOURNE M. WILLIAMS, JR., has been elected a director of the B. F. Goodrich Co. to fill the vacancy created by the resignation of **COL. ALBERT A. SPRAGUE** of Chicago. **ARTHUR B. NEWHALL** was appointed a vice-president and was elected a director to fill the vacancy created by the recent resignation of **J. D. TEW.** Mr. Williams is president of the Freeport Sulphur Co. and Mr. Newhall is president of the Hood Rbbber Co., a Goodrich subsidiary.

C. H. BLISS, formerly vice-president and director of sales of the Nash Motors Division, has been named a vice-president of the corporation in charge of Canadian and export sales of Nash products, as well as in charge of the performance of other duties assigned by the president's office.

DENIS MULLIGAN, director of the Bureau of Air Commerce, whose job passed out of existence last Tuesday when the Bureau was transferred to the new Civil Aeronautics Authority, has resigned to practice law in New York City. Although Mr. Mulligan could have continued with the new Authority for a six-month period, after which he would have been eligible for a permanent appointment, he handed in his resignation to Edward J. Noble, CAA chairman, who accepted it with "reluctance." Mr. Mulligan will represent the CAA at the September meeting in Brussels of the Fourth Diplomatic Conference on Private Air Law, it was announced by Mr. Noble.

LEE J. EASTMAN, president, Packard Motor Car Co. of New York, was host to 20 Packard "old timers" who have been associated with the company 25 years or more at a three-day outing at Westchester Country Club, this week. (Monday to Wednesday.) **ALVAN MACAULEY,** president of Packard, was one of the veterans.

H. O. HILL, a member of the United American Bosch Corp.'s staff of Diesel injection equipment engineers, has been transferred from the Chicago territory to Detroit.

W. D. SULLIVAN is now western representative for the Heating-Ventilating Division of Evans Products Co. Mr. Sullivan's organization will cover California, Washington, Oregon, Idaho, Montana, Utah, Nevada, and Arizona.

ROY H. SJOBERG has been named sales representative in the New York district for the J. G. Brill Co.

PLANS for GM's "Highways and Horizons" building at New York World's Fair site are examined "on location" by W. S. Knudsen, president of the corporation, and Norman Bel Geddes, designer. Pioneers who campaigned for good roads a quarter of a century ago were guests of Mr. Knudsen Aug. 22 at ceremonies inaugurating the exhibit building and at luncheon at the Terrace Club.

Photo by Frank P. Tighe

Britisher Reports Plans for Car Without Gears or Clutch

Designs for an unconventional automobile without transmission gears or clutch were disclosed by Prof. Frederick C. Lea, formerly of Sheffield University, in a paper presented at Cambridge, England, on Aug. 22, before the British Association for the Advancement of Science. Professor Lea claims that the gearless car—in which a centrifugal pump is used in lieu of the orthodox clutch and gear box—would use less gasoline, increase tire mileage and quicken acceleration. Such an automobile has been tested, it is reported, for more than 65,000 miles.

An English company apparently is being formed to promote the invention which is credited to Commendatore Piero Salerni, an Italian engineer residing in England.

The new method of transmission is said to be applicable also to airplanes, ships, and railroad trains.

Comment on the Leaf-Spring Institute's Recommendations

In discussing the S.A.E. papers on Leaf Springs by J. H. Shoemaker and K. K. Probst, printed in the AUTOMOTIVE INDUSTRIES of June 25 and July 9, B. Stern of the Chrysler Corporation, pointed out that the two principal recommendations made in the papers were that variable-rate springs should be substituted for constant-rate springs to reduce the effect of load on the riding qualities, and to favor tension shackles over compression shackles, because the former lower the frequency of the springs. He was not in agreement with the recommendation regarding shackles, as his organization had found that the tension shackle increased the difference in frequency over the load range, and thereby tended to nullify the advantage of the variable-rate spring. Tests on a Chrysler Corporation standard rear spring, with an angle of 60 deg. between the shackle and the line connecting the axes of the spring eyes, showed that with a compression shackle the frequency dropped from 82 with a one-passenger load to 76 with a five-passenger load, whereas with a tension shackle (of the same length, at the same angle, and with the same spring) the frequency dropped from 77 to 62.

Mr. Stern observed that if the variable-rate spring is introduced, a change will have to be made in the method of calculating the frequency. In the well-known formula for frequency, the factor representing the static deflection of the spring must be replaced by the quotient of the load by the rate at that load.

Another recommendation made was that if the variable-rate spring is to be designed in three "stages," the second "stage" should come into action just beyond the one-passenger load, while the third "stage" should come into action only beyond the five-passenger load, its principal function being to prevent bottoming.

Nash-Kelvinator Abandons Operations at Racine

Nash-Kelvinator has abandoned operations at its Racine plant of Nash Motors division. Nearly 3000 employes were notified. All operations on Nash cars will be concentrated at the Kenosha plant, it was announced. A marked upturn in business as to make a profitable reopening of the plant at Racine, is given as the only likelihood of such action.

TOOLS OF TOMORROW

Center-Lapping

. . . Ex-Cell-O machine offered for parts to be ground between centers to close tolerance on diameter

A quick, low-cost solution to the problem of accurately centering parts which are to be ground between centers to close tolerance on the diameter for roundness, is said to be provided by a new center-lapping machine manufactured by the Ex-Cell-O Corp., Detroit.

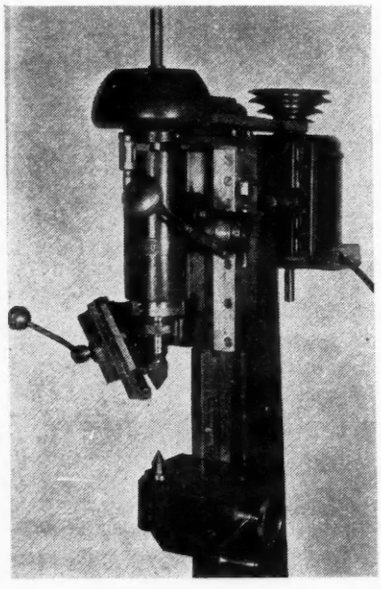
The machine will lap centers on work up to 8 in. in diameter and up to 36 in. in length. One end of the work is placed on a vertically adjustable center which can be rapidly positioned by means of a hand crank operating a pinion on a rack mounted on the machine column. The lapping stone carrying spindle is then lowered to lap the center in the other end.

Two four-step pulleys are provided for changing spindle speeds, the spindle being driven from the motor through a V-belt. Normally, it has been found that 5000 r.p.m. is a good speed for use. To prevent belt tension from being transmitted to the spindle shaft, a floating spline bushing is interposed between the spindle pulley and the spindle proper.

The spindle housing is mounted on balls in hardened and ground "V" ways, and is operated vertically by means of a hand lever. The entire assembly is counterweighted to provide maximum sensitivity to lapping pressure.

The diamond dresser for the lapping stone is mounted in a fixed 60 deg. angular position on the column of the machine. Dressing the lapping stick is accomplished by holding the spindle at the extreme down position while the diamond tool is moved across the abrasive stone by means of the dresser handle. The holder itself is mounted on balls in hardened and ground "V" ways.

The lapping stick may be moved down independently of the spindle housing, the stick being fed down for successive passes of the dresser, by a slight turn of the lever knob.



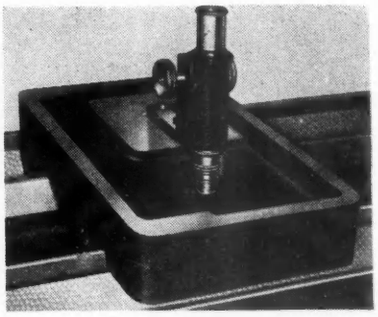
Ex-Cell-O center-lapping machine

Aligning Instrument

. . . Designed for aligning long Cincinnati grinding machine beds

The Cincinnati microscope aligning instrument shown in the illustration on this page is designed specifically for aligning long Cincinnati grinding machine beds. It consists of a cast-iron platen having a "V" and flat bearing, duplicating the table bearing surface which contacts the bed, so that the aligning instrument will be guided in the same path as the machine table. Mounted on the platen is a microscope, having an accurately divided scale across the optical field. This scale, graduated in half-thousandths, indicates the deviation of the guiding V-way from a straight line when readings are taken at regular intervals and on the same side of the wire. The wire is stretched tight from one end of the bed to the other, and forms a straight line for taking readings.

Two-foot intervals are recommended for taking the readings. White paper placed under the wire at these intervals and a shielded light bulb on a long extension cord, will greatly aid visibility. To avoid any possibility of error being introduced by the wire, a new length of wire should be used for each test.



Cincinnati microscope alignment instrument

To allow for this, a reel of steel music wire, approximately 750 ft. long, is included with each aligning instrument.

Spiral Grooves

. . . Solution to problem of machining spiral grooves worked out by Colonial Broach

A simple solution to the problem of machining external spiral grooves such as oil grooves on guide bushings, etc., was worked out recently by Colonial Broach Co. Using a "Utility" Press, the broaches were built into the fixture and the part pushed through the fixture by means of the ram. The latter was provided with a spirally grooved extension separated from the upper part of the ram by ball bearings.

This spiral groove mates with projections in a stationary guide bushing in the top of the fixture, causing the bar to rotate and turn the part by engaging a key-way. Thus, while the ram moves downward the part is both pushed and turned through the fixture and broaches, dropping out through the bottom of the fixture. The ram then returns to the top of the stroke to complete the cycle.

Broaches are of simple design consisting of helical inserts mounted at an angle conforming to the desired helical lead of the groove.

Improved Overdrive

(Continued from page 243)

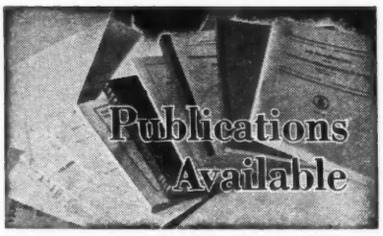
so long as the car speed is above the overdrive cut-out speed. When the pawl returns to its normal position, the overdrive ratio again comes in, provided the car is above the cut-in speed.

The means for pulling out the pawl at the right time, releasing the sun gear and dropping back into direct drive, resides in a solenoid mounted on the intermediate member, the plunger of the solenoid

pulling the pawl out against a light spring pressure. The switch for energizing the solenoid is on the accelerator linkage and is closed when the accelerator is pushed beyond the wide-open position. A slight hard spot provided at this point warns the driver that he is at the wide-open position so that he will not go on through inadvertently. The solenoid has two coils. The first one is quite powerful, as it has to pull the plunger over a considerable gap. The second is merely a holding coil, serving to keep the pawl out against a comparatively light return spring. It does not operate across a gap and pulls a very light current.

As soon as the solenoid plunger carrying the pawl reaches the outer end of its stroke, it automatically opens the main solenoid circuit, leaving only the holding coil circuit on. The sequence is so fast that the main coil is on for only an instant.

As the accelerator is released for return to overdrive, the switch in the pedal linkage opens, cuts out the current in the holding coil. Thereupon, the return spring permits the pawl to shift into one of the notches in the sun gear head. Operation is said to be smooth and instantaneous, producing a feeling of completely automatic action so far as the driver is concerned.



A booklet illustrating the possibilities of **stainless steel** for consumer products and industrial applications has been published by Joseph T. Ryerson & Son, Inc., Chicago. A brief summary of Allegheny Stainless products carried in stock by Ryerson is included.*

The new reconditioning service on 2-in., 3-in., and 4-in. **Johansson gage blocks** is briefly described in circular No. 7010 issued by the Ford Motor Co.*

Shaw-Box Crane & Hoist Division, Manning, Maxwell & Moore, Inc., Muskegon, Mich., has issued bulletin No. 339 which describes its line of "Budgit" **hoists.***

A 64-page catalog entitled **"TAG Indicating, Recording and Controlling Instruments for Temperature and Pressure"** has been published by C. J. Tagliabue Mfg. Co.*

Bakelite Corp.'s new **cellulose-acetate thermoplastic materials** for injection and compression molding are described in a recently issued pamphlet.*

Industrial Clutch Co., Waukesha, Wis., describes its new **Servo-action punch press clutch** in an illustrated bulletin.*

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

AUTOMOTIVE ABSTRACTS

Calcium as a Hardening Agent for Lead

Extended research work has been carried out on the influence of calcium additions on the hardness of lead, and a number of alloys of considerable commercial value have been developed.

During the world war the scarcity of antimony, which was employed as an alloying element for lead used in the manufacture of projectiles, led to the use of lead-calcium alloys containing 2 per cent of calcium and lead-barium-calcium alloys containing 2 per cent of barium and 1 per cent of calcium. Since that time more extensive research work has led to the development of two distinct series of alloys, viz., lead-calcium alloys with precipitation-hardening properties, and lead-calcium alloys for bearing purposes.

The lead-calcium diagram shows a solid solution rich in lead. At the temperature of the peritectic reaction, calcium is soluble in lead to the extent of 0.10 per cent, while at atmospheric temperature only 0.01 per cent of calcium will dissolve in lead. There is therefore a possibility of structural precipitation of the compound Pb_3Ca.

The addition of small proportions of calcium, of the order of 0.10 per cent, by heating the mixture to 590 deg. Fahr. with the object of throwing the Pb_3Ca into solid solution; rapid cooling, and aging at normal temperature for a week, followed by an anneal at 212 deg. Fahr. for 18 hours, yields an alloy which has a tensile strength of approximately 8000 lb. per sq. in. and an elongation of 40 per cent.

These values are substantially the same as those for conventional antimonious lead, but lead-calcium has the following advantages over the former:

After treatment the mechanical properties of lead-calcium alloy are very stable, while those of lead antimony change for years.

The fatigue resistance is definitely greater than that of lead-antimony.

The corrosion resistance is greater, which is due to the fact that in aged lead-calcium alloys the compound Pb_3Ca is precipitated in a very fine state and well dispersed, whereas lead antimony consists of dendrites of solid solution rich in lead, surrounded by an eutectic network.

Lead calcium alloys may be laminated cold; the alloy containing 0.04 per cent calcium can be rolled cold with a reduction of 95 per cent, and gives a tensile strength of 6000 lb. per sq. in. after the aging treatment described in the foregoing.

Owing to the combination of properties referred to, lead-calcium alloys containing from 0.02 to 0.1 per cent of calcium have found extensive application for sheathing electric cables and for the manufacture of grids and plates for storage batteries.

Lead-calcium alloys containing from 0.5 to 3 per cent of calcium contain large hard crystals of Pb_3Ca in a ductile matrix of solid solution rich in lead, and therefore have a structure which is very similar to that of the conventional "anti-friction" metals. The hardness of the lead, moreover, is increased much more by a certain addition of calcium than by an equal addition of antimony. Among the best-known lead-calcium bearing metals is the Bahnmetal, used by the German State railroads, which contains 0.75 per cent calcium, 0.5 per cent sodium, and 0.5 per cent lithium.—*Chimie et Industrie* for April.

Specific Heats of Gases at High Temperatures

On the recommendation of the Engine Sub-Committee of the (British) Aeronautical Research Committee the National Physical Laboratory some time ago undertook a redetermination of the specific heats of gases at high temperatures. While the experimental work has been completed, the data have not yet been fully analyzed. The results obtained are said to agree well with those obtained recently by private investigators using the spectroscopic method. At the Laboratory the temperature and composition of the gases were measured directly after ignition in a high-pressure ves-

sel of spherical shape. It is realized that there must of necessity be an unknown temperature gradient throughout the charge, and a special investigation has proved necessary to assess the discrepancy which results from the mathematically less intractable assumption that the heat exchange to the vessel walls is that due to a gaseous charge without temperature gradients.

One other factor that has appeared to exert a critical influence on both the computed explosion pressure and the heat released by the reaction is the degree of dissociation of the explosive mixture under the prevailing conditions of high pressure and temperature. For this and other reasons the results arrived at are admittedly only approximate, and it is hoped that it will prove possible to deduce values for specific heat from an alternative mode of experiment in which the desired results can be achieved independently of a direct measurement of the heat loss.

So far the facilities of the N.P.L. for calibrating carburetor nozzles have been limited to a flow rate of 2 liters per minute, but it has now been decided to instal in the engineering department a standard calibrating machine capable of dealing with nozzle capacities up to 10 liters per minute. Contributions to the cost of the equipment will be made by the Air Ministry, the Society of British Aircraft Constructors and the Society of Motor Manufacturers and Traders.—*Engineering*, Aug. 12.

Effect of Reinforcement at Oil Holes on Torsional Endurance Limit

Endurance torsion tests on hollow crankpins have been made by Heinrich Cornelius and Franz Bollenrath of the German Experimental Laboratory for Aviation. Apparently some trouble had been experienced with hollow crankpins having oil holes through the walls at the middle of their length. Tests were made on specimens of two different designs. The original design had an outside diameter at the ends of 3 in., and a length of 16 in., and the outside diameter was reduced to 2.4 in. at the middle over a length of 8 in. The bore was 1.6 in., uniform throughout, and an oil hole of 0.2 in. diameter extended through both walls at the center. The new specimen was of substantially the same design, the only difference being that a throat was formed at the center, reducing the bore to 0.8 in. over a length of 0.8 in. There were liberal fillets at all changes in section, and all surfaces were polished.

Specimens were made of five different materials, one a case-hardening steel with 0.19 per cent carbon, the remainder oil-hardening steels with larger carbon contents. All steels contained chromium, nickel and molybdenum, and two of them also contained vanadium.

With the outer surface case-hardened, the endurance limit of the specimen was increased from 12,200 to 16,500 lb. per sq. in. by "throating" the hollow pin at the center where the oil holes are located; when the specimens were made of an oil-hardening steel the endurance limit in torsion was increased from 20,700 to 27,800 lb. per sq. in. In the case of this material the endurance limit of the throated specimen with oil holes was about the same as that of the plain specimen without oil holes. When the specimens were nitrided on the outside, the endurance limit was increased from 26,400 to 33,200 lb. per sq. in. by throating. The test was applied also to specimens of steel containing 0.32 per cent of carbon and also chromium, nickel and molybdenum, which were first heat-treated and then hardened by the double Duro (acetylene) hardening process. In that case the endurance limit was increased only from 22,700 to 24,100 lb. per sq. in. by throating. The explanation given for the comparatively small increase in the endurance limit in this case is that directly below the case there is a layer which is softened by the heat treatment. It is planned to also investigate the effect of throating in the case of a Tocco-hardened specimen.—*V. D. I.*, July 23.

Recent Improvements in Archaouloff Fuel Injection System

The Archaouloff fuel injection system for Diesel engines was first developed in 1923 and practically applied by the Société Générale des Constructions Mécaniques in Courneuve, France. In this system each engine cylinder has its own injection pump, which is combined with a pneumatic cylinder communicating with the engine cylinder, so that the power for the fuel-injection stroke is derived from the compression in the engine cylinder. When fuel injection pumps with plungers actuated by cams appeared on the market, the Archaouloff system was temporarily abandoned, but it was taken up again nine years later and is said to have been developed to a high state of perfection in Germany and Sweden. So far the system has been applied only to large engines, and about 300,000 hp. of marine engines have been equipped with it, most of them being conversions from air injection. In the latest design the pneumatic piston with its packing rings is replaced by a bellows construction, which eliminates sliding friction and the need for piston rings and lubrication. While the system has been used mainly on low-speed engines, experiments with it have been made on a Junkers-type two-stroke aircraft engine built by the Compagnie Lilloise de Moteurs, of 80 mm. bore, where it is said to have given excellent results up to the limiting speed of the engine, 1600 r.p.m.—*Génie Civil*, Aug. 6.

Books

of automotive interest

A SYMPOSIUM ON PHYSICS IN THE AUTOMOBILE INDUSTRY. *Published by the American Institute of Physics, 175 Fifth Ave., New York. $1.*

On March 14 and 15 last the American Institute of Physics in collaboration with the Department of Physics of the University of Michigan held a symposium on "Physics in the Automobile Industry," at Ann Arbor, and the various addresses and papers presented there have now been issued in bound form to make them available to men in the industry. Among the addresses of a general nature are one on "Physics and the Automotive Industry," by Dean F. K. Richtmyer of Cornell University and one on "Scientific Training and Its Relation to Industrial Problems," by C. F. Kettering. Contributions on specific technical subjects include the following: Contribution of the Physicist to Highway Illumination, by Clifton G. Found; Studying Engine Combustion by Physical Methods, by Lloyd Withrow and Gerald M. Rassweiler; Mobility Method of Computing the Vibration of Linear Mechanical and Acoustical Systems, by F. A. Firestone; Studies in Lubrication, by M. Muskat and F. Morgan; Human Beings and the Motor Car, by Carl Breer; Physics of Rubber as Related to the Automobile, by W. F. Busse; Some Physical Problems in Noise Measurement, by Paul Huber, and Photoelastic Analysis Practically Applied to Design Problems, by O. J. Horger.

New Synchronizer

Warner Gear Device for Remote Control and Power Shifting

Anticipating a widespread trend in the adoption of remote control of transmission shifting, incident to the elimination of the "wobble stick," the Warner Gear Division, Borg-Warner Corp., is offering the industry a new crash-proof synchronizer in which, it is said, the external operating force has been reduced to almost the vanishing point.

This development is the end product of long experimentation, culminating in a general type of synchronizer which is termed comparatively inexpensive, highly satisfactory as to function and life. It is claimed that in the past most synchronizers have not been entirely crash-proof, and in order to make the friction cones effective, it was necessary to introduce rather high poppet action, demanding extra leverage in the control so as to relieve the operator of the effect of the synchronizing action.

The new synchronizers employ the blocking principle, using floating synchronizer rings which can be either die cast or drop forged in a single piece from a special alloy of hard bronze. The rings carry chamfered clutch teeth on their outer circumference, the chamfers forming the ramps necessary to give the desired blocking action.

Economy of construction is afforded by making the hub member axially fixed on the transmission main shaft, taking the end thrust of the constant running intermediate main shaft gear against it. Heretofore this hub has floated axially on the shaft, requiring independent means for taking care of end thrust.

For engaging the synchronizer rings and also to limit their rotation with respect to the hub member within the limits of the blocking ramps, three light-weight thrust members are provided in slots around the circumference of the hub member. Surrounding the hub member is the usual internally toothed sliding sleeve, the chamfered teeth of which first engage the chamfers on the teeth of one or the other of the synchronizer rings for blocking purposes, and then, after synchronization, engage the positive clutch teeth of whichever gear is being picked up.

Based on these general principles, Warner Gear has developed a number of different ways of accomplishing satisfactory results. Very light ball spring poppets may be used, or a light spring ring, something like a snap ring, may surround the hub and the thrust members, tying them together and engaging a small notch in the outer sleeve, to give a semblance of poppet action but so slight that it cannot be felt by the fingers. Engagement between the thrust members and the outer sleeve also may be entirely frictional.

In all the various ways in which this construction can be adopted, the initial action on the synchronizer rings is very light. Following that, the blocking action is said to be so powerful as to make it impossible to force through and get a crash. As soon as the synchronization has been accomplished, the synchronizer slides into positive engagement with finger-tip effort on the control lever.

The action of this type of synchronizer is said to be not only highly satisfactory for manually operated remote controls, but also to lend itself particularly well to any power shifting device, for the reason that the blocking action is sufficiently strong to hold back the power shift until synchronization has taken place.

Calendar of Coming Events

CONVENTIONS AND MEETINGS

National Petroleum Association Meeting, Atlantic City, N. J.....Sept. 14-16
American Foundrymen's Association Fall Technical Conference, Ann Arbor .....Sept. 15-17
Seventh International Management Congress, Washington .....Sept. 19-23
National Lubricating Grease Institute, Annual Convention, Chicago ..Oct. 3-4
SAE National Truck, Bus & Railcar Meeting, Chicago .....Oct. 4-5
American Society of Mechanical Engineers Meeting, Providence.....Oct. 5-7
SAE National Regional Fuel and Lubricants Meeting, Tulsa, Okla..Oct. 6-7
SAE National Aircraft Production Meeting, Los Angeles .....Oct. 13-15
A.S.T.E. Annual Meeting, Pittsburgh, Oct. 14-15
National Metal Exposition, Detroit, Oct. 17-21
American Welding Society Meeting, Detroit .....Oct. 17-21
SAE Annual Dinner, New York....Nov. 14
SAE National Transportation Engineering Meeting, New York....Nov. 14-16
National Safety Council Meeting, Chicago .....Nov. 14-18
American Petroleum Institute Meeting, Chicago .....Nov. 14-18
National Industrial Traffic League Meeting, New York .....Nov. 17-18
Automotive Service Industries Show, Chicago .....Dec. 5-10
*National Standard Parts Association Meeting, Chicago .....Dec. 2-3
SAE Annual Meeting, Detroit.....Jan. 9-13

SHOWS

20th Annual National Metal Exposition, Detroit .....Oct. 17-21
New York, National Motor Truck Show, Nov. 11-17
New York, National Automobile Show, Nov. 11-18
Pittsburgh, Pa., Automobile Show, Nov. 11-18
Detroit, Mich., Automobile Show, Nov. 11-19
Columbus, Ohio, Automobile Show, Nov. 12-18
Buffalo, N. Y., Automobile Show.Nov. 12-19
Chicago, Ill., Automobile Show.Nov. 12-19
Milwaukee, Wis., Automobile Show. Nov. 12-19
Minneapolis, Minn., Automobile Show, Nov. 12-19
*Philadelphia, Pa., Automobile Show, Nov. 12-19
*San Francisco, Calif., Automobile Show .....Nov. 12-19
Boston, Mass., Automobile Show, Nov. 12-19
Los Angeles, Calif., Automobile Show, Nov. 12-20
*St. Louis, Mo., Automobile Show, Nov. 12-20
*Elmira, N. Y., Automobile Show, Nov. 14-19
New Haven, Conn., Automobile Show, Nov. 14-19
Indianapolis, Ind., Automobile Show, Nov. 19-25
Baltimore, Md., Automobile Show, Nov. 19-26
Rochester, N. Y., Automobile Show, Nov. 19-26
Montreal, Canada, Automobile Show, Nov. 19-26
*Washington, D. C., Automobile Show, Nov. 19-26
*Cincinnati, Ohio, Automobile Show, Nov. 20-26
Newark, N. J., Automobile Show, Nov. 26-Dec .3
Denver, Colo., Automobile Show, Dec. 5-10

*Tentative

Mexico To Boost Import Duties On Passenger Automobiles

Restoration of import duties on passenger automobiles to the higher levels prevailing in Mexico from Jan. 18 to May 1 of this year will be effective Aug. 30, the Commerce Department's Bureau of Foreign and Domestic Commerce reports. The Mexican decree increases the duties on six and eight cylinder passenger automobiles from 600 to 700 pesos each and on buses from 1000 to 2000 pesos each. The report said a number of modifications in duty rates on parts and material used in the assembly of cars in Mexico will also go into effect.

At the same time, duty reductions on a wide range of crude and semi-manufactured products have been ordered.

Yellow Truck Dividend

Yellow Truck & Coach Mfg. Co. has declared a quarterly dividend of $1.75 per share on the company's seven per cent Cumulative Preferred stock, payable Oct. 3 to stockholders of record Sept. 15.

How Do Buyers Feel About Today's Cars

This is the third of a series; the results of a survey of car owners. Through the course of these articles public favor has been thoroughly diagnosed

By THOMAS G. MACGOWAN*

RADICAL departures in appearance do not offer to the automobile manufacturer a royal road to the heart—and purse—of the American car-consuming public.

That much, at least, is obvious from a study of the findings of the appearance phase of the national study which we have conducted among automobile owners.[1]

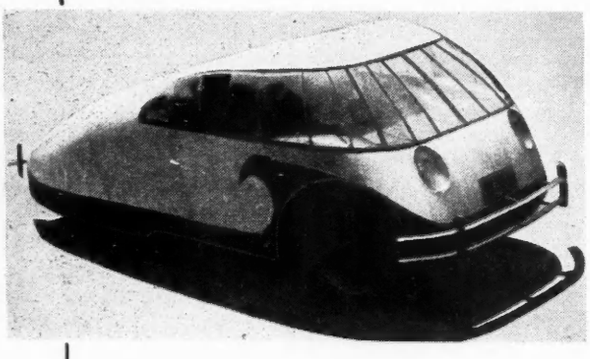
It is, however, no more obvious than is the fact that automobiles which seem to the public to lag behind the procession in looks, have little chance to win widespread favor.

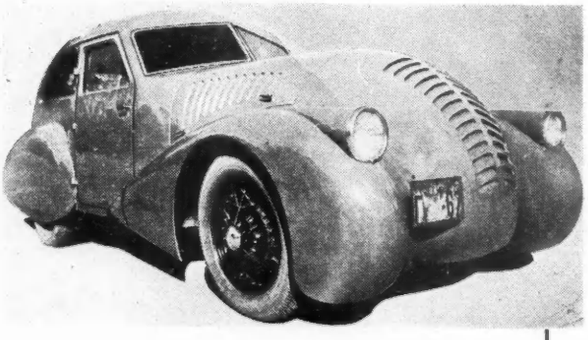
The best-liked cars are those which impress buyers as being abreast of current style but not a minute in advance of it. People in their thirties are more favorable than others to the more daring styles. Women, as compared with men, are style conservatives.

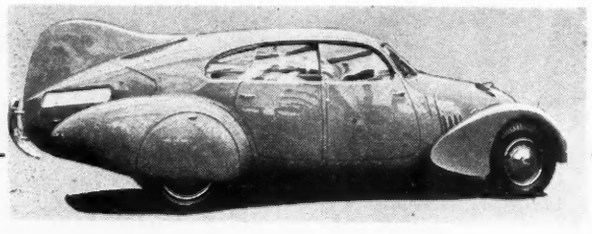
In attempting to measure the appearance-attitudes of American car owners we used a pioneering technique, which involved showing them photographs of a considerable number of automobiles and questioning them, meanwhile, in accordance with a new method.

Each interviewer was equipped with a set of 32 pictures, 26 of which represented American mass-production cars of the 1938 model, and 6 of which represented foreign, experimental, specialized or theoretical cars of very advanced design.

These ultra-advanced-design cars were: (1) the Stout Scarab—1936;







The front of the Nitiken (upper right) was its largest objection. Bridges' car (upper left) was deemed too advanced while the Peugeot (lower left) had a rear that was not appreciated

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* An article concluding the survey will be published in an early issue of AUTOMOTIVE INDUSTRIES. Mr. MacGowan is president of Facts, Inc., independent market-research agency in New York. The field surveys, on which the articles are based, were made by Facts, Inc., with the cooperation of AUTOMOTIVE INDUSTRIES.

[1] A total of 542 automobile owners, nationally distributed, were interviewed by trained investigators. Besides appearance, the survey covered opinions of present-day cars, ideas for their improvement and opinions on safety.

. . . Today?

(2) an original design by a young American industrial designer, R. W. Bird; (3) the Peugeot (France), 1936; (4) a streamlined 6-passenger car designed by Nitikin, a Russian engineer; (5) the rear-engine "crash-proof" car designed by Dr. Calvin B. Bridges, nationally known biologist; and (6) a new streamlined car made by Maybach in Germany.

These cars were all selected for definite reasons. The Scarab and the Bridges cars are examples of no-hood, rear-engine, streamlined construction, with many windows. The Peugeot, with short sloping hood and huge plane-like tail or fin at the rear is an example of radical streamlining. The other three cars represent various types of streamline design.

The 32 pictures all showed the cars in three-quarter or nearly three-quarter views. Some were pointed to the left, some to the right. The pictures were mounted in groups of 4, and all the cars in each group were headed in the same direction.

The very advanced-design cars were distributed so that no group of 4 contained more than 1 of them. The pictures were numbered from 1 to 32, and all names or symbols appearing on hub caps, radiator shells, hoods or elsewhere were removed.

Frankly, our technique was experimental. It was recognized that inequalities in the photography, retouching or reproduction might tend to detract from the accuracy of the test. Too, inclusion of the ultra-advanced models would divert some attention from the standard American products. It was not known, moreover, whether it would be possible in any case to get a reliable expression of mass opinion on automobile styling simply by showing photographs.

Perhaps such an expression could be obtained only by letting the cooperating car owners look at real automobiles of steel and glass and rubber.

Small Samples Can Give Accurate Results

THIS is the day of polls and surveys. The scientific researcher, sending his field investigators into cities and hamlets from Maine to Oregon, is alike the counsellor of political chieftains and captains of industry.

Plans—questionnaire investigation—tabulation—analysis. Over and over this sequence is repeated. And every time it ends, public questions have been answered or commercial decisions made possible.

The trend in the investigating business is ever toward more and more precise and truly scientific methods. A great magazine through errors in "sampling" failed with its presidential poll despite millions of straw ballots. Other polls, using surprisingly small but soundly distributed samples — several hundred for a state, in many cases—succeeded with their presidential polls.

In the present investigation by Thomas G. MacGowan, head of a well-known market research organization, the scientific sampling technique is employed. The number of persons interviewed is small, but they are so chosen as to typify car owners in general.

This survey was so planned as to produce a reliable total sample and to make the various breakdowns stable enough to be highly indicative of the various trends shown.

At any rate, the idea was not necessarily to get finely shaded opinions as to the *relative merits* of the appearance of the various cars of current American manufacture. These were the objects of the test:

1. To learn whether reasonably reliable expressions of consumer opinion on appearance could be obtained by using pictures in personal interviewing.
2. To get a general idea of what *type* of automobile—conservative, middle-of-the-road, advanced or ultra-advanced—is best-liked by the public, and how the other types stand.
3. To discover something about the style preferences of men, women, the various age groups and people in the leading automobile price-classes.
4. To find out, when people did not like one of the cars very well, just what they didn't like about it.

As a more or less inevitable by-product of this type of study we have of course acquired competitive rankings of almost all the passenger cars made commercially in this country. These rankings should be considered with full realization that the technique is experimental.

Now—for the technique in detail.

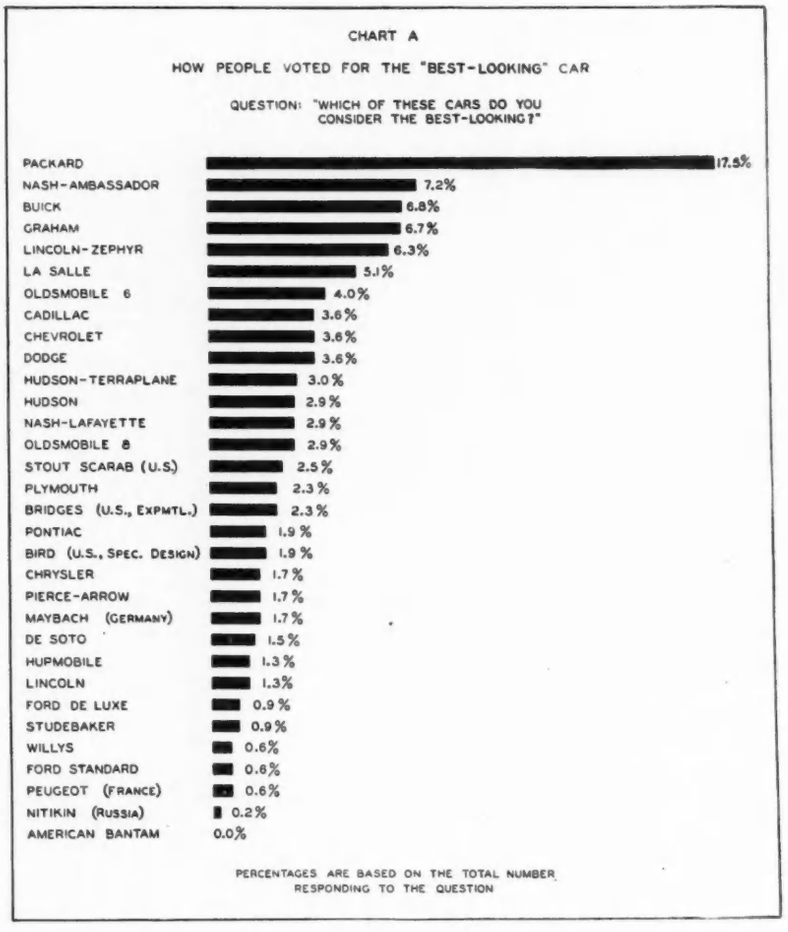
First of all each interviewer showed the pictures (eight groups of four), one group at a time, asking, as each group was shown:

"Which of these cars do you consider the best-looking?"

When one car had been picked in each group, the interviewer showed all eight which had been selected, and asked:

"Which of these eight is the best-looking?"

The car then mentioned was taken as the "best-looking car" chosen by that respondent.



This part of the technique was in its general intent comparable with the method which we have often used in our automobile show surveys, one of the key questions of which, asked of show visitors, has always been: "What car do you think is best-looking, regardless of price?"

In the show surveys people look at actual cars and pick the best-looking. In this survey they made their selections from pictures. How closely do the results obtained by the two methods agree?

They agree reasonably well. There are many differences in *order*, but, generally speaking, if a car did well in the 1938-model show survey it did well in the present project, and if it did badly in the show survey, it did badly here.

This comparison would, of course, tend to vindicate in a general way the picture-showing technique.

In considering the findings on this question, it should be borne in mind that the respondents were asked to name the "best-looking car," and not to give an *appearance rating* to each car. Appearance ratings which take into account all shades of opinions were obtained from another question. This one simply measures the ability of the various types of cars and, to a lesser extent, of the individual cars, to generate *positive enthusiasm.*

First taking up the standings of the makes, we find that Packard is far out in front, with more than *twice* as many "votes" as any other make. Here are the ten leading cars, with the percentage of all responding owners who named them:

	Per Cent
Packard	17.5
Nash Ambassador	7.2
Buick	6.8
Graham	6.7
Lincoln-Zephyr	6.3
La Salle	5.1
Oldsmobile "6"	4.0
Dodge	3.6
Cadillac	3.6
Chevrolet	3.6

The totals for all cars are given graphically in Chart A, while a complete breakdown by sub-groups of respondents appears in Table 1.

Packard won in every sex, age and price-class grouping of respondents, but its commanding lead comes largely from the low-priced owners and from the owners who were more than 40 years old.

The breakdowns in Table 1 show some significant variations from the general pattern. The Lincoln-Zephyr, rated No. 2 by men, could do no better than a three-way tie for 16th, 17th and 18th places in the women's ratings. La Salle and *all* the very advanced-design cars were likewise better-liked by men than by women. Women particularly favored Packard, both Nashes, Hudson and Hudson-Terraplane, Plymouth and Pierce-Arrow.

Car owners under 30 years of age were much more partial to Graham and Buick than were owners above 30. They ranked these two cars a very close second and a close third to Packard, respectively. Lincoln-Zephyr and the Ford de Luxe, which, like Graham, show advanced streamlining, were also more popular with owners under 30 than with other owners.

However, the ultra-advanced-design cars found their strongest support—not in the youngest age group—but in the 30-to-39-year and 40-years-and-over groups.

The most significant feature of the price-class breakdown is the overwhelming preference for Packard among low-priced owners. These owners also liked Lincoln-Zephyr and Cadillac much better than did owners of higher-priced cars. Owners of medium- and high-priced cars were a lot more partial to Chevrolet than were owners in Chevrolet's own price-class.

Preference for extreme designs does not seem to be related clearly to price-classes of cars owned.

The *all-over* picture, so far as preference for the various *types* is concerned, seems to be about this:

> The leaders in the "best-looking" competition include both conventional designs and fairly advanced types, with the former having the edge.
>
> The ultra-advanced cars do not make out so well, and no car which might be considered backward in styling attains a good position.

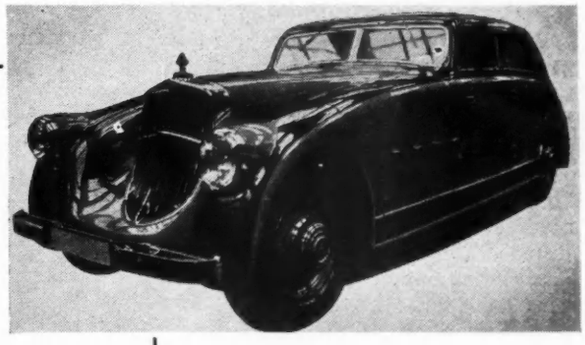
So much, then, for "best-looking" cars.

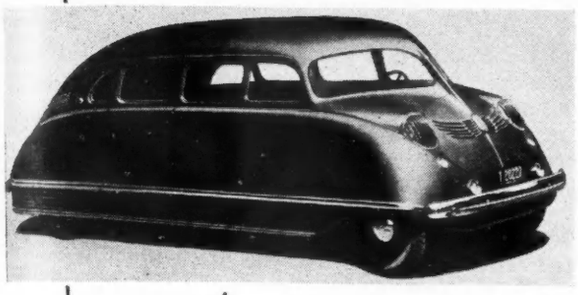
This type of question brings forth expressions of enthusiasm, as would be expected of a question that asks car owners to award premier appearance honors.

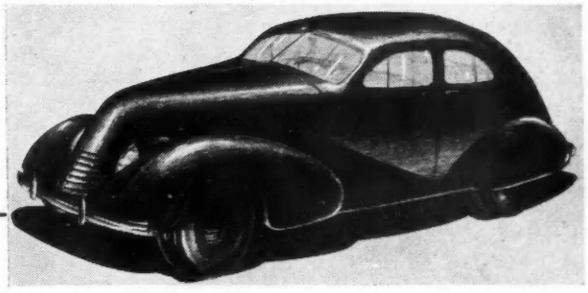
As such, it is interesting, provocative and, unless balanced by a question of another type, sometimes just a bit misleading. What about the people who didn't like the various cars? Graham won high rank as a "best-looking" car. How many people would have rated it at the bottom of the pile?

When the interviewers had finished the "best-looking" question, they

The Maybach (upper right), the Bird (lower right) and the Stout Scarab all were presented in the survey for their advanced styling.







showed the pictures to the respondents one at a time, asking with regard to each:

"How would you rate this car on appearance—excellent, good, fair or poor?"

Considering the responses of "excellent" first, we find some interesting differences between the cars rated among the first ten on the "best-looking" question and those among the first ten here. But Packard and Nash Ambassador are still on top: (Percentages show proportion of "excellent" ratings to all ratings for each car.)

	Per Cent
Packard	42.9
Nash Ambassador	36.7
Hudson	29.9
Cadillac	29.6
Buick	29.3
La Salle	28.9
De Soto	28.9
Chevrolet	26.3
Nash-LaFayette	25.3
Lincoln	24.0

In order to develop appearance ratings which give due weight to mentions of "good," "fair" and "poor," as well as of "excellent," we assigned fixed percentage values to the four types of mention.[2] These values were used to compute the percentage ratings appearing in Chart B (totals) and Table 2 (breakdown by sex).

By this system of measurement, Packard still holds its lead, but the Nash Ambassador has moved up into a near-tie, with Nash-LaFayette close behind. The first ten:

	Ratings Per Cent
Packard	69.1
Nash-Ambassador	68.1
Nash-LaFayette	66.0
De Soto	65.8
Buick	65.6
La Salle	65.1
Dodge	65.1
Chevrolet	65.0
Cadillac	64.6
Hudson	64.5

Table 2 shows much more clearly than this first ten list how the percentage-rating order differs from the "best-looking" order given in Table 1.

The cars which have dropped out of the first ten are Graham, Lincoln-Zephyr and Oldsmobile "6". Stand-

[2] Excellent, 87.5 per cent; good, 62.5 per cent; fair, 37.5 per cent; and poor, 12.5 per cent.

HOW PEOPLE VOTED FOR THE "BEST-LOOKING" CAR

Question: Which of these cars do you consider the best-looking?

Each respondent was shown 5 by 8 in. unidentified pictures of all cars mentioned. These are believed to be the largest pictures ever used in a survey of this kind.

Table 1 — Percentages*

CARS	SEX		AGE			PRICE CLASS OF CAR OWNED		TOTAL
	Men %	Women %	Under 30 %	30 to 39 %	40 & Over %	Low %	Med. & High %	%
Packard	16.9	18.7	14.1	14.6	23.4	22.1	11.9	17.5
Nash Ambassador	6.3	9.4	5.1	7.9	8.6	6.2	8.5	7.2
Buick	6.8	6.9	10.1	6.7	3.4	6.2	7.6	6.8
Graham	6.5	6.9	12.4	4.9	2.9	5.6	8.0	6.7
Lincoln-Zephyr	8.2	1.8	9.0	6.1	4.0	7.6	4.7	6.3
La Salle	6.0	3.1	6.7	4.9	4.0	5.2	5.1	5.1
Oldsmobile 6	4.4	3.1	5.1	4.9	2.3	2.4	5.9	4.0
Dodge	3.8	3.1	2.2	4.9	4.0	3.0	3.8	3.6
Cadillac	3.3	4.4	3.4	3.0	4.6	5.2	1.7	3.6
Chevrolet	3.3	4.4	1.7	5.5	4.0	0.7	7.2	3.6
Hudson Terraplane	2.2	5.0	4.5	1.8	2.3	3.1	3.0	3.0
Oldsmobile 8	3.0	2.5	1.7	3.7	3.4	1.7	4.3	2.9
Hudson	2.2	4.4	1.7	2.5	4.0	3.0	2.1	2.9
Nash La Fayette	2.2	4.4	1.7	2.5	3.4	2.1	3.8	2.9
Stout Scarab (U.S.)	3.0	1.3	1.1	4.3	2.3	2.1	3.0	2.5
Bridges (U.S.)	2.5	1.8	2.2	1.8	2.9	2.4	2.1	2.3
Plymouth	1.9	3.1	2.2	2.5	2.3	3.1	1.3	2.3
Pontiac	2.2	1.3	1.1	1.2	3.4	1.7	2.1	1.9
Bird (U.S.)	2.2	1.3	2.2	1.2	2.3	1.7	2.1	1.9
Maybach (Germany)	1.9	1.3	1.1	1.8	2.3	1.0	2.5	1.7
Chrysler	1.6	1.8	0.6	1.8	2.9	2.1	1.3	1.7
Pierce-Arrow	1.1	3.1	0.6	3.7	1.1	1.7	1.7	1.7
De Soto	1.1	2.5	1.1	1.8	1.7	1.7	1.3	1.5
Lincoln	1.4	1.3	2.2	0.6	1.1	1.4	1.3	1.3
Hupmobile	1.4	1.3	1.1	0.6	1.7	1.7	0.8	1.3
Ford de Luxe	1.4	...	1.7	1.2	...	1.7	...	0.9
Studebaker	1.1	0.6	2.2	0.6	...	0.7	1.3	0.9
Peugeot (France)	0.8	...	0.6	1.2	...	1.0	...	0.6
Willys	0.5	0.6	0.6	0.6	0.6	0.3	0.8	0.6
Ford Standard	0.5	0.6	...	0.6	1.1	0.3	0.8	0.6
Nitikin (Russia)	0.3	...	...	0.6	...	0.3	...	0.2
American Bantam	...	...	...	...	...	...	...	...
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

* Percentages are based on the total number of persons responding.

ing Nos. 4, 5 and 7 in the "best-looking" vote tally, they drop to Nos. 21, 19 and 13 in the present tabulation. Nash-LaFayette, De Soto and Hudson, meanwhile, have climbed into the first ten. De Soto's rise was especially spectacular; No. 23 in the "best-looking" ratings, this car is now in 4th position in the rating scale.

Eighteen out of the 32 cars tested scored 60 per cent or better. There were 6 with standings between 50 per cent and 60 per cent. Only 8 fell below the 50 per cent mark.

All of the cars in the first ten employ styling in the conventional or moderate school. Some of these, such as De Soto, Buick, La Salle and Hudson, lean away from conservatism. Others lean toward it—such as Packard, the two Nashes and Dodge.

And all the cars in the *last* ten are in the radical streamlining, ultra-advanced group, except for Pierce-Arrow and American Bantam, which may be classed as very conservative, and Ford de Luxe, in which the streamlining tendency is not radical.

We may group the 32 cars in the study into four type-classes:

TYPE 1—*Conventional or Moderated*

Includes 19 cars—all except those specifically listed under other types below.

TYPE 2—*Fairly Far Advanced*

Includes 5 cars—Lincoln-Zephyr, Graham, Ford Standard, Ford de Luxe and Willys.

TYPE 3—*Very Advanced*

Includes 6 cars—Bird, Maybach, Stout, Bridges, Peugeot and Nitikin.

TYPE 4—*Very Conservative*

Includes 2 cars — American Bantam and Pierce-Arrow.

Granting that these classifications are somewhat arbitrary, it is nevertheless interesting to study the *average position* of each type in Table 2:

	Average Position
Type 1	10.1
Type 2	22.0
Type 3	28.7
Type 4	27.5

The lead of the conventional or moderate type of car is very clear. The fairly far advanced type is much less attractive to consumers. Least attractive of all and about on a par with each other we find the very advanced and the very conservative types.

Summing up the appearance findings thus far we come to these general conclusions:

1. The experimental picture-showing technique is at least partially validated by its agreement with earlier surveys in which most of the same cars were tested.

2. The present general order of style preference by types is: (1) conventional or moderate, (2) fairly far advanced, and (3) very advanced and very conservative.

Some cars which are fairly far advanced arouse a considerable amount of positive enthusiasm, but this is to a great extent offset by the exsistence of counterbalancing negative sentiment.

Conversely, some conventional-type cars which few persons think of enthusiastically attain high ratings because few people actively dislike them.

3. Men are more favorable than women to advancement in ideas in automobile design, but neither sex cares for the extreme in motor car style.

People in their twenties show more enthusiasm for fairly far advanced styles than do other age groups.

No age group favors extreme styling although people of 30 and over like it better than people below that age.

The study investigated reason for *unfavorable* attitudes toward the appearance of the various cars, but it did not find out why *favorable* reactions were reported. Favorable reasons on automobile appearance tend to be vague; unfavorable ones are very often specific.

Every time a car owner said he thought one of the automobiles pictured was "fair" or "poor" in appearance, the investigator asked him:

"What do you dislike about it?"

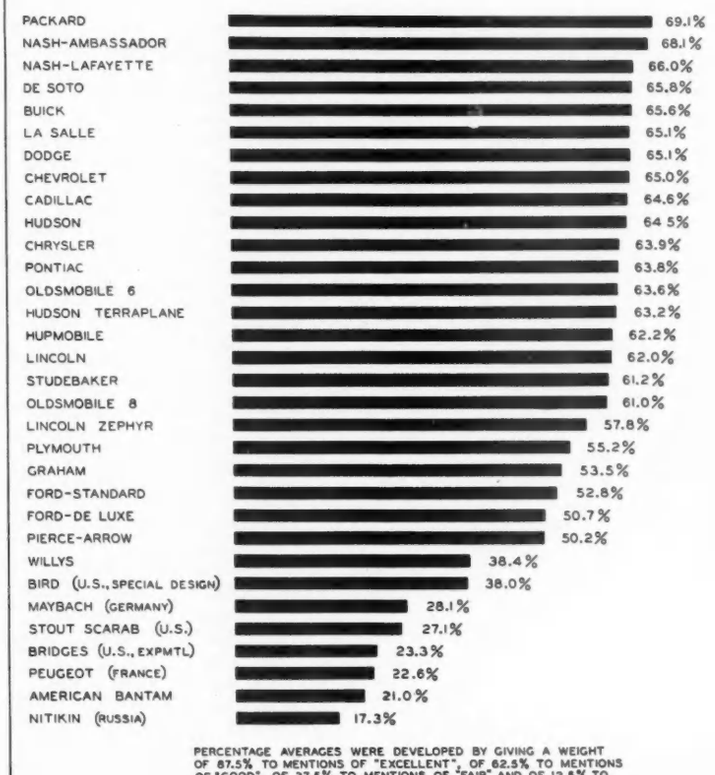
A general tabulation of the responses is presented in Table 3. In this table the cars are grouped into four classifications and the reasons are consolidated under more or less general headings.

From it a broad idea of the causes of appearance dissatisfaction of the cars can be obtained. Some additional detail will help, however, to

CHART B

AVERAGE APPEARANCE RATINGS OF ALL CARS

QUESTION: "HOW WOULD YOU RATE THIS CAR IN APPEARANCE - EXCELLENT, GOOD, FAIR OR POOR?"



PERCENTAGE AVERAGES WERE DEVELOPED BY GIVING A WEIGHT OF 87.5% TO MENTIONS OF "EXCELLENT", OF 62.5% TO MENTIONS OF "GOOD", OF 37.5% TO MENTIONS OF "FAIR" AND OF 12.5% TO MENTIONS OF "POOR".

fill in the picture for some of the makes.

In the case of American Bantam the table tells most of the story. The car is not considered sufficiently "advanced" in appearance, and there are many objections to its size and shape.

Willys had more "fair" and "poor" mentions (354) than any other low-priced car. Here modernity was not important as an adverse factor. The front end generally and the radiator and hood specifically accounted for 36.3 per cent of the answers. Even more of the responses (37.3 per cent) concerned the car's size and shape; most of these said it was "squatty," "too small" or "too short."

Dissatisfaction with the front end was shown in 46.7 per cent of the responses on Ford de Luxe, which received 233 "fair" and "poor" mentions. The radiator design was the leading cause of complaint.

The "general appearance" of the Ford Standard (193 "fair" and "poor" mentions) tied with "squatty" and "too short" at the head of this car's list of unfavorable comments. Actually, however, various front end features were adversely mentioned nearly as often as the car's shape and size.

In the case of Plymouth a "blunt" radiator led the list of reasons underlying 165 negative appearance attitudes. Grouping of the mentions shows that this and other front end features received 29.8 per cent of the responses, while citations of "squattiness," "stubbiness," and other size or shape features received 29.9 per cent of them. A fair proportion of those who did not care for Plymouth considered it not sufficiently modern.

Nash-LaFayette, Chevrolet and Hudson-Terraplane were mentioned adversely by comparatively few persons, whose comments show no marked centers of appearance-dissatisfaction for any of the three.

The comments show that the poor position of Willys, the two Fords and Plymouth is traceable to criticism of both their front ends and their general short proportions, with Plymouth suffering some from the feeling that it is not up-to-date in looks. There were few criticisms of the rear of any of the cars and none that they were too long.

The 19 cars in medium- and high-price groups cannot all be taken up in detail, but some highlights can be pointed out.

Pierce-Arrow had more "fair" and "poor" mentions than any other car above the low-price field. Nearly half the reasons (44.9 per cent) expressed the thought that its appearance was not sufficiently up-to-date.

AVERAGE APPEARANCE RATINGS OF ALL CARS

Question: How would you rate this car on appearance—excellent, good, fair or poor?

Table 2 **PERCENTAGE RATINGS**

CARS	TOTAL	MEN		WOMEN	
		Rating	Rank	Rating	Rank
	%	%		%	
Packard	69.1	69.6	1	67.9	1
Nash Ambassador	68.1	68.6	2	66.9	4
Nash La Fayette	66.0	65.5	5	67.1	3
De Soto	65.8	65.4	6	67.6	2
Buick	65.6	65.9	4	64.9	9
La Salle	65.1	66.6	3	61.9	16
Dodge	65.1	64.7	9	66.1	7
Chevrolet	65.0	64.8	8	66.1	8
Cadillac	64.6	65.3	7	63.1	11-12
Hudson	64.5	63.7	13	66.5	5
Chrysler	63.9	63.8	12	64.3	10
Pontiac	63.8	64.4	10	62.3	15
Oldsmobile 6	63.6	63.9	11	62.8	13
Hudson Terraplane	63.2	61.9	15	66.3	6
Hupmobile	62.2	61.9	14	62.7	14
Lincoln	62.0	61.5	16	63.1	11-12
Studebaker	61.2	61.2	17	61.2	18
Oldsmobile 8	61.0	60.6	18	61.9	17
Lincoln-Zephyr	57.8	58.8	19	55.5	19
Plymouth	55.2	55.6	20	54.3	20
Graham	53.5	54.1	21	51.9	21
Ford Standard	52.8	53.4	22	51.6	22
Ford de Luxe	50.7	51.8	23	48.2	24
Pierce-Arrow	50.2	50.6	24	49.2	23
Willys	38.4	38.8	26	37.5	25
Bird (U.S.)	38.0	39.1	25	35.5	26
Maybach (Germany)	28.1	28.9	28	26.5	27
Stout Scarab (U.S.)	27.1	29.3	27	22.0	28
Bridges (U.S.)	23.3	25.3	29	18.4	31
Peugeot (France)	22.6	24.1	30	19.0	29
American Bantam	21.0	22.0	31	18.8	30
Nitikin (Russia)	17.3	18.0	32	15.8	32

Percentage ratings were developed by giving a weight of 87.5% to mentions of "excellent", of 62.5% to mentions of "good", of 37.5% to mentions of "fair" and of 12.5% to mentions of "poor."

Graham's main difficulty centers about its front end. "Front," "radiator," "hood," and "headlights" were mentioned by 36.6 per cent of those who rated the car "fair" or "poor." The leading individual reason for disliking it, however, was "fenders":

Fenders	36
Front	28
Radiator	24
Too advanced	24
Hood	19
Others	85
	216

An even higher percentage of the Lincoln-Zephyr mentions (48.6) concern the car's front end. Scarcely anyone considered the car "too advanced."

The large Lincoln was more frequently cited for being "not advanced" than for any other reason.

The big reason for not liking Oldsmobile "8" was the front end, especially the radiator; 53.4 per cent of the responses named some front end feature. The front came in for more criticism, relatively, than that of any other car.

The radiators of most of the other cars in the high-medium group brought them their greatest number of "fair" and "poor" mention. These cars included Oldsmobile "6", Chrysler. Pontiac, Hudson, Dodge, Buick and Packard. Despite its preservation of its traditional radiator lines, Packard received almost no mentions as being "not advanced."

Nash-Ambassador's hood was the feature most often named for it. No one disliked its radiator. This car and Nash-LaFayette were the *only two* to receive no adverse radiator comments. De Soto's hood was its weakest spot, as was that of LaSalle.

The front fenders were responsible for more disapproval of the Studebaker than was any other feature of the car; 51.6 per cent of the Studebaker mentions concerned the front end. "Fenders"—not necessarily front—was the leading Cadillac response. General appearance leads the Hupmobile list.

A general study of the medium-high group shows that front ends, especially radiators, are the leading cause of consumer disapproval of these cars on the score of appearance. The most-disliked fronts belong to Graham and Lincoln-Zephyr, with the two Oldsmobiles and Studebaker following. Rear ends are not a serious adverse factor, except with Pierce-Arrow and Lincoln-Zephyr.

In this group Graham is the only car which an appreciable number of owners think is too far advanced in style. Pierce-Arrow, Lincoln and

REASONS BEHIND NEGATIVE ATTITUDES ON APPEARANCE

Question: What do you dislike about it?
(Asked only of respondents who rated the various cars either fair or poor, as to appearance)

Table 3 — GENERAL SUMMARY

CLASSES OF CARS	SPECIFIC PARTS				MODERNITY						
	Front	Rear	Misc.	Total	Ad-va'ced	Not Ad-va'ced	Total	Size and Shape	Adverse Com-parisons	Misc.	Grand Total
VERY LOW-PRICED											
American Bantam	3	4	13	(20)	3	130	(133)	135	16	102	406
LOW-PRICED											
Chevrolet	7	3	8	(18)	0	3	(3)	13	0	7	41
Ford de Luxe	97	16	14	(127)	3	0	(3)	41	3	34	208
Ford Standard	45	7	15	(67)	0	1	(1)	49	0	34	151
Hudson-Terraplane	14	11	8	(33)	1	7	(8)	8	0	1	50
Nash-La Fayette	6	5	7	(18)	1	3	(4)	4	1	5	32
Plymouth	37	1	14	(52)	0	19	(19)	37	1	15	124
Willys	111	5	16	(132)	4	2	(6)	114	5	49	306
TOTAL	317	48	82	(447)	9	35	(44)	266	10	145	912
MEDIUM AND HIGH-PRICED											
Buick	26	0	15	(41)	0	6	(6)	8	0	1	56
Cadillac	17	4	18	(39)	0	12	(12)	15	0	9	75
Chrysler	18	2	5	(25)	0	3	(3)	14	0	8	50
De Soto	16	0	2	(18)	0	5	(5)	5	0	9	37
Dodge	19	0	3	(22)	3	3	(6)	5	0	9	42
Graham	79	12	40	(131)	27	5	(32)	16	0	37	216
Hudson	28	2	7	(37)	0	3	(3)	23	0	9	72
Hupmobile	19	3	6	(28)	0	8	(8)	6	0	17	59
La Salle	17	2	13	(32)	1	8	(9)	7	0	9	57
Lincoln	26	3	11	(40)	1	11	(12)	19	0	11	82
Lincoln-Zephyr	72	14	19	(105)	6	1	(7)	7	2	27	148
Nash Ambassador	16	6	9	(31)	1	2	(3)	14	0	8	56
Oldsmobile 6	32	1	17	(50)	1	2	(3)	3	1	7	64
Oldsmobile 8	47	1	14	(62)	0	3	(3)	11	0	12	88
Packard	21	3	7	(31)	1	4	(5)	9	0	10	55
Pierce-Arrow	20	19	14	(53)	0	84	(84)	23	1	26	187
Pontiac	16	3	6	(25)	1	10	(11)	2	0	5	43
Studebaker	31	0	11	(42)	1	1	(2)	6	0	10	60
TOTAL	520	75	217	(812)	43	171	(214)	193	4	224	1447
ULTRA-ADVANCED											
Bird (U.S. Special Design	88	3	20	(111)	63	0	(63)	21	6	89	290
Bridges (U.S. Experimental)	6	7	23	(36)	94	0	(94)	34	40	190	394
Maybach (Germany)	34	0	40	(74)	83	0	(83)	49	19	161	386
Nitiken (Russia)	63	1	27	(91)	44	0	(44)	49	34	201	419
Peugeot (France)	8	53	7	(68)	97	0	(97)	15	46	156	382
Stout Scarab (U.S.)	15	2	15	(32)	51	0	(51)	63	124	103	373
TOTAL	214	66	132	(412)	432	0	(432)	231	269	900	2244

Cadillac are the only ones in which lack of modernity is cited often enough to be interesting.

The comments on the ultra-advanced cars were naturally very numerous. They tended to be less specific than the reason for disliking the other cars.

The Nitikin, most disliked car in the survey, received many mentions of "too advanced." Even more persons called it "hideous" or "freakish" or said it looked "like a monster."

The Peugeot, possessor of a short and sharply sloping front end, received almost no front end mentions.

Its greatest drawbacks, in the eyes of those who disliked it, were its very advanced appearance, its tail-like rear end and its resemblance to a racing car or an airplane.

The car designed by Dr. Bridges, hoodless and without a front radiator, received scarcely any front end mentions. Extreme modernity and its appearance generally were the chief complaints. Its "resemblance to a bus" was the comment made most frequently about the Stout Scarab; 102 persons vouchsafed this explanation of their disapproval of the Scarab's styling. Although it has no hood, there were very few mentions of the front end.

"Too advanced" was the reason most often advanced by people who did not like the German Maybach. Next to that came its "general appearance" and the statement that it was "badly proportioned."

The car designed by R. W. Bird received more mentions of its "general appearance" than of any feature or type of feature. After that came the thought that it was "too advanced," then, in order, "hood," "front," "too much streamlining" and "the radiator." Mentions of the front end, including hood, radiator and headlights, totalled more than those of any other part.

Several clues to present consumer reactions to advanced design may be obtained from a study of the comments on the ultra-advanced cars. Clearly, there is little direct objection to the absence or minimizing of the hood, when the car as a whole is advanced in design. Whether the respondents were diverted, in the cases of the hoodless or nearly hoodless cars, from such objections by a desire to voice more general complaints is of course an open question.

When the appearance could be compared unflatteringly to some other type of conveyance, the respondents were quick to do so. And when the styling moved into fields beyond their ken, they would in a very large proportion of the cases come forth with a damning and dogmatic "freakish," "hideous" or "grotesque."

So—today the automobile style preference barometer points to "conventional or moderate." The typical car owner now wants his automobile to be up-to-date, but somewhat restrained. If Mr. Average were to give tongue to his motor style thought of the moment he would probably say:

"Make my car modern, but not at all extreme."

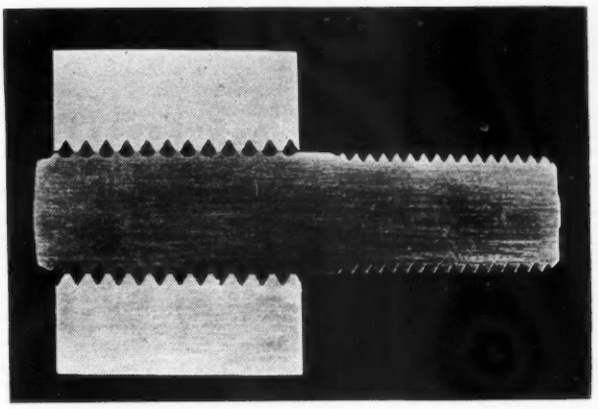
Of course, what is "modern" changes and with it changes what Mr. Average would like. As the automobile style weather shifts, so shifts the style preference barometer. And if enough manufacturers elect to make style advances they will in time swing the public preference into line.

But right now, when it comes to automobile styles which are "advanced," the two thumbs of Mr. Average are pointing sternly downward.

Research into Metallic Carbides Funded

THE administrative council of the Belgian National Scientific Research Fund at a recent meeting made grants for researches in different lines of industry, among the studies to be financed being an investigation of the structure of magnetic steels, an investigation of the physico-chemical conditions which govern the formation of metallic carbides of high hardness index, and an investigation of the phenomena which govern the behavior of coiled filaments in electric lamps. For the current year the Fund has approximately 900,000 Belgian francs available. The industries interested in the various projects contribute at least one-half to the cost of the investigations.

Aero-Thread Screw System

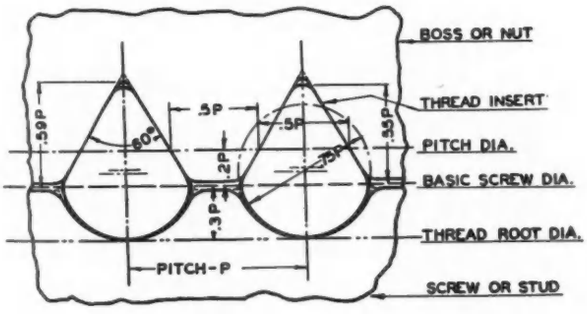


Section of steel screw and aluminut with Aero-Thread insert.

A NEW type of screw fastening for use particlularly in materials that do not hold their threads well, such as aluminum and magnesium and their alloys, has been developed by Aircraft Screw Products Co., Inc., 80 Moultrie Street, Brooklyn, N. Y. By allowing for the differences in the physical properties of the steel screw and the light-alloy part, the Aero Thread is claimed to permit full utilization of the inherent strength of the steel screw member without difficulty due to the relative softness or the higher thermal expansion of the light alloys.

The Aero-Thread screw system provides a smooth hard metal lining in the light-metal threaded part which protects the threads in that part against wear and abrasion and results in a stronger thread surface having good anti-friction qualities. This hard-metal lining allows the use of a shallow circular thread groove on the screw member, which gives that member greater static and dynamic load capacity.

Instead of the steel screw engaging directly with the light alloy boss, as in the conventional screw thread fastening, the "Aero-Thread" screw system provides a specially formed spring wire thread insert between the two mating threaded members. This thread insert is assembled into the tapped hole, where it acts as an armor protection to the light metal threads and at the same time provides a smooth hard bearing surface of good anti-friction and non-seizing properties for the engaging screw member.



Proportions of the Aero-Thread screw system.

The enlarged view through the screw fastening shown above gives the proportions of the "Aero-Thread" screw system. Referring to this figure, it is seen that the screw member has a relatively shallow thread groove whose cross-section is the segment of a circle. This circular thread form produces a screw member of substantially higher strength, particularly under impact and fatigue loadings, than do the angular thread forms that are employed with other screw systems. Due to the comparative shallowness of the circular thread form, with its resulting small bearing area, it is essential for this screw thread to contact a material having adequate hardness and good bearing qualities. The hard-drawn spring wire of the thread insert is made of either bronze or stainless steel.

While this system of screw fastenings has been developed primarily for use in aircraft engines and in the light-metal housings of mechanical units used on aircraft, applications in other fields will no doubt suggest themselves. There might be advantages in the use of this form of thread in the big ends of connecting rods.

Brazil Promoting the Use of Gasoline-Alcohol Blends

THE oil companies which supply Uruguay with petroleum products have been compelled to sign a new agreement with the Government-controlled Ancap refinery, under which they will not import any refined petroleum products in the future, but only crude oil, which will be refined in the Ancap refinery.

Experimental Procedure o

By J. M. CRAWFORD
and P. A. COLLINS*
Chevrolet Motor Division,
General Motors Corp.

IN addition to the work of the Chevrolet staff at the proving grounds, the corporation staff in charge of the general operations furnish, through the chief engineer, a mass of stastical data and performance characteristics of all cars of domestic production, as well as foreign cars of interest to any division. Information of this type shows Chevrolet's competitive position from the viewpoint of a disinterested party. As a matter of fact, corporation products never get the benefit of the doubt, in comparisons set up by this division.

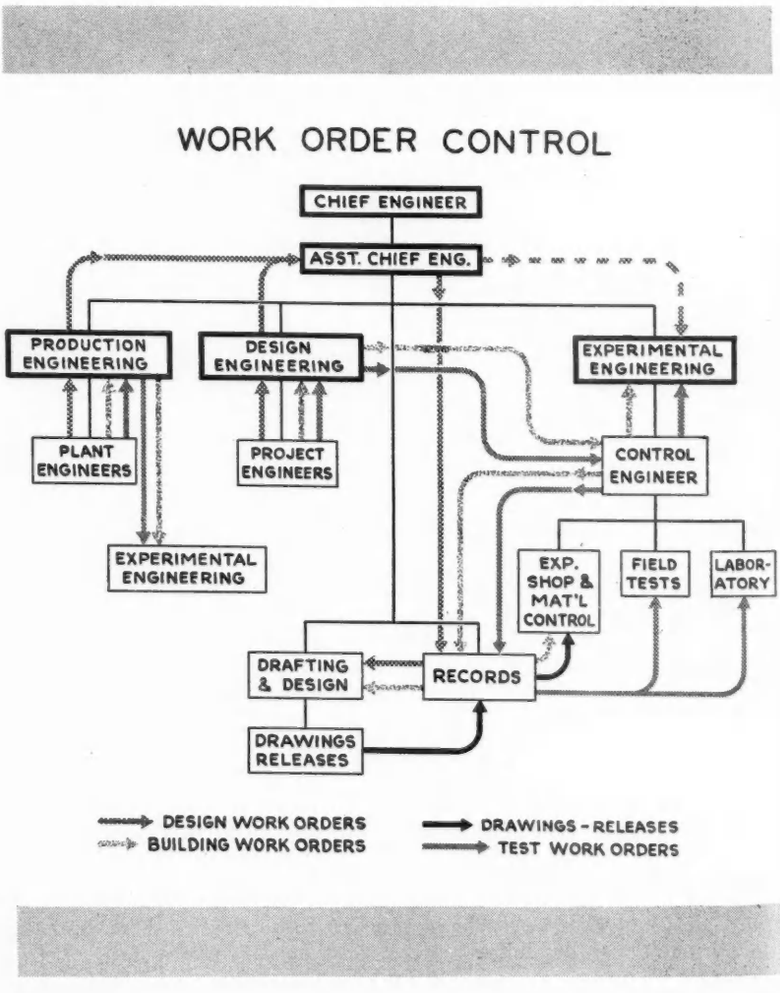
When failures occur in durability development testing, an improved design is re-tested at the proving ground only after an improved laboratory result has been obtained. Immediately following the failure, steps are taken to reproduce the result in the laboratory by special tests, so that a "base line" can be set up. Dynamometers or water brakes are used on units requiring power absorption; stroking machines where deflection of structural parts is the cause of failure. This method of development, after a given result on the road is produced, greatly accelerates the work and reduces it to a scientific basis. When the life of the unit or part is brought up to that of successful designs in actual production, it is re-tested at the proving grounds. It is true that a great deal of the development work can be and is done in the laboratory before road tests are attempted; but road tests are necessary to establish a base line before the job is completed.

Probably more use is made of the laboratory in engine development than in the development of any other unit of the car, and there are two additional reasons for choosing such use as an example to show the experimental procedure functions in car development. First, engine development presents by far the greatest number of problems; second, it brings out the necessity of planning well in advance when radical changes are contemplated and large-scale manufacturing plants are involved.

When the engine design was started in April, 1934, no installation requirements were set up; it was merely to be a powerplant of minimum weight and length, for a piston displacement range of 207 to 224 cu. in. Increased smoothness and economy were also major requirements.

Inasmuch as the Chevrolet valve arrangement does not determine the length of the engine, the crankshaft became the starting point; and so, two engines of 209 cu. in. displacement (3 7/16 in. bore by 3¾ in. stroke) were built and ready for the dynamometer test in November, 1934. The length of the block itself was based on a 3 9/16 in. bore, but the smaller size was selected for test, so that a direct comparison for efficiency could be made with the then production engine of 207 cu. in. The crank pins were of 2 5/16-in. diameter, and the main bearings were abnormally large, Nos. 1 and 4 being 4 in. in diameter. This combination in a short-stroke shaft produced a large overlap at arms Nos. 1 and 9, so that only a ¼-in. web was felt necessary to join crank pins Nos. 1 and 6 to the end main bearings.

Other features of the engine not before used in Chevrolet production designs included full-pressure lubrication, a chain-driven camshaft, and four-ring pistons. Because of these new features, it was necessary that a great many production studies be made from layouts before the



* Paper presented at the Summer Meeting of the S.A.E. Slightly condensed.

# of Testing at Chevrolet

Part Two

Part One appeared in the August 13 issue of AUTOMOTIVE INDUSTRIES *on Page 198*

details were released for samples.

Provision was also made in the original design so that the regular method of handling the above features could be incorporated at a later date, without in any way compromising the results to be obtained from the new features. In other words, all development is undertaken with a view to establishing direct comparisons between one construction and another, with a minimum of variations in related parts which may have some bearing on the final result.

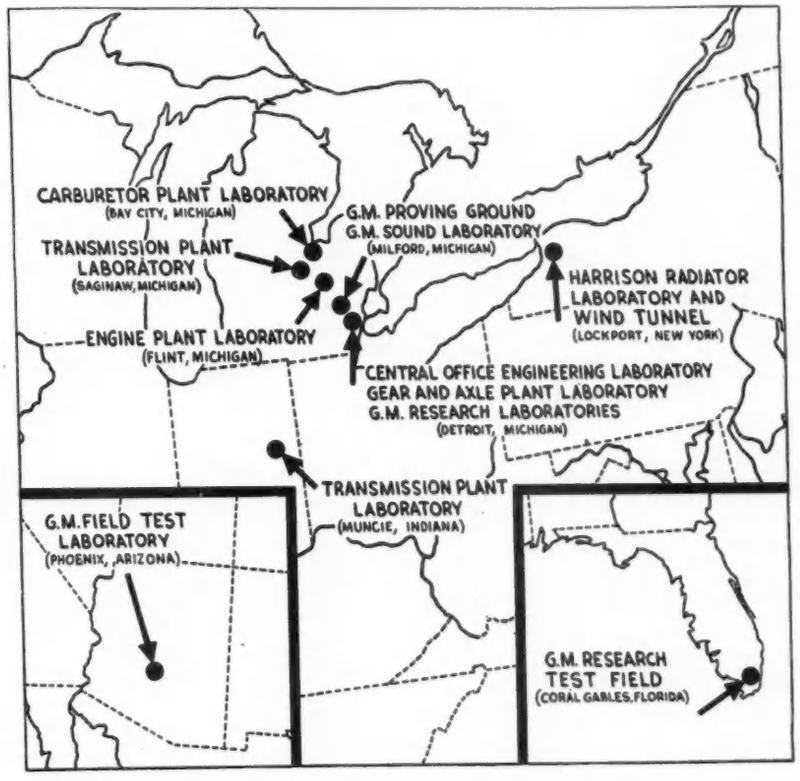
The development test on the above engine started in the laboratory, November, 1934. Within a week, proving-ground tests of a duplicate engine were started. Dynamometer tests immediately brought out the lack of durability of the main bearings, and the proving-ground tests were discontinued after 17,000 miles. These failures resulted in the building of two more engines, with changes in the crankshaft designed to overcome the difficulties encountered. These tests were confined to the laboratory, and as the results were unsatisfactory the design was abandoned.

The third series of engines, which retained all of the new features with the exception of the crankshaft, were put on test, April 23, 1935. The crankshaft on these engines was of a more conventional design. Inasmuch as the main bearings were still much larger than ever before employed, this new crank was subjected to a large number of tests, involving studies of oil-pressure and delivery requirements, the effects of various methods of grooving the bearings and drilling the crankshaft, and effects of the crankcase ventilating system on the problems encountered.

Of this third design, 18 engines were built, so that tests could be run on the proving ground for durability, economy and performance, the proving-ground results being constantly checked with those of the laboratory. Engines were also installed in current-production cars with various axle ratios, to put the engineers in a position to evaluate the factors of flexibility, smoothness, economy, and performance. Three engine sizes, of 209, 216, and 224 cu. in. displacement, were used for this purpose. The noise level at various road speeds and with various exhaust systems was studied. The effect of the body (which was just getting into production) on the noise level also was studied by the engineers driving these cars.

As a result of these observations, the engineering department recommended the adoption of the 216-cu. in. engine for further development in connection with two different axle ratios. The management approved these recommendations, after trials at the proving ground, on the basis of performance and smoothness compared to the 1936 production model. This, as stated before, was on Oct. 18, 1935.

After this decision, a more intensive study was made by the manufacturing department, and changes in the crankshaft design were recommended to permit of new methods of line-boring the camshaft and crankshaft bearings in the case. The design was changed, and new sample



Testing laboratories are situated at the branches as well as the home plant

engines were installed in proving-ground and engineers' cars. Unfavorable results were reported by both. Special instrumentation relating to dynamics was then developed by the GM Research Laboratory, and used in the Chevrolet Laboratory to find the source of the trouble.

Instead of returning to the original design, which had been successful in demonstrations, a major change was made that affected the crankshaft, crankcase, and wheelbase length, the object being a greater factor of safety than provided by the original design. This change was approved April 9, 1936, after several engines had been rebuilt and tested. Production was not delayed by this change, because the engineering department releases tooling and equipment in accordance with the results of tests. These items are handled separately from the release of final designs.

The piston furnishes another example of cooperation between the shop and the engineering department, and illustrates the extremes to which both go to secure an improvement in results. To start with, a conventional 4-ring, cast-iron piston was used, of 32-oz. weight. The wrist pin was of 1-in. diameter, with a lock screw in one pin boss, and full pressure feed to the pin. Dynamometer horsepower tests eliminated this piston design. Development then turned to an extremely light steel casting, with a domed head and a slipper skirt, employing a wrist pin of ⅞ in. diameter.

Dynamometer tests for 50 hours under full load at maximum speed gave satisfactory results. Manufacturing studies were started immediately, sample production machinery was purchased, and all machining problems were worked out. In the meantime a detailed investigation was made of the structural and heat-dissipation characteristics of the design, and a number of engines were tested in cars and trucks at the proving grounds and in the laboratory under full load at various speeds.

As a result of these investigations the weight was gradually increased, until it was thought possible to substitute a high-tensile cast iron for the steel. The steel pistons for this experimental program were made with metal-pattern equipment, and were machined by the production department on machine tools especially purchased for this design.

The cast-iron development that followed resulted in a slight increase in weight, and the same production equipment was utilized. The weight was well under that of the original piston, for which the connecting rods and rod bearings had been designed and tested, so that satisfactory results from these parts could be guaranteed. In the meantime, however, the oiling system had been changed, which had its effect on the piston-pin-boss design. Piston development was concluded by testing 87 engines from production tools, the clearance being set 0.00025 in. closer than had been specified previously.

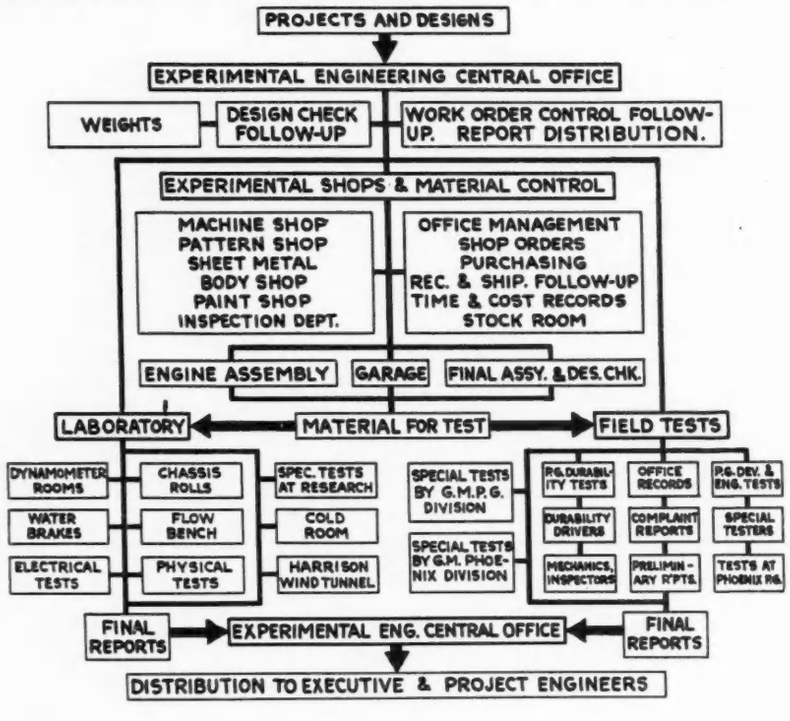
Aluminum and malleable-iron pistons also were investigated, largely on the recommendation of the research laboratory. Various ring combinations, differing with respect to number of rings, width, shape and tension, were investigated by means of tests bearing on blowby, oil control, and wear characteristics. In this investigation, the laboratories of the sources of supply participated. Close cooperation on the part of the engineers responsible for the various details was called for, as it was necessary to determine the effects of various designs on other problems.

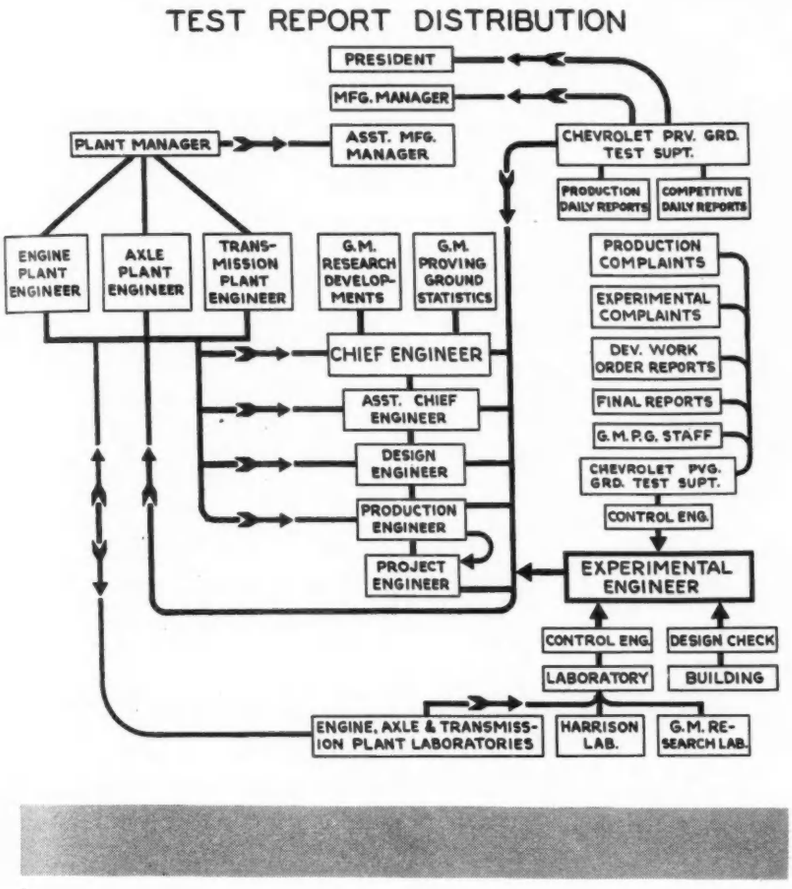
Aside from problems of combustion-chamber shape and spark-plug location, the most interesting work on the cylinder head consisted in cooperating with the foundry in solving problems of core assembly, wiring of cores, and provision of sufficient sand at the "lean" spots in the head to permit proper venting. These problems, of course, are peculiar to the valve-in-head design, and are looked after from the beginning of design, by the production engineer.

All sample heads and sample cylinder blocks are furnished by the production foundry at Saginaw, and an arrangement is in force with the foundry management that no samples shall be furnished for tests unless duplicate castings can be furnished by production methods with minimum scrap loss. As extreme precision in core manufacture and molding methods is insisted on, this does not result in excessive weight.

The plant production engineer is responsible for all tests in connection with "cleaning up" complaints arising from foundry variations. What these variations are likely to be he determines before production begins

EXPERIMENTAL ENGINEERING ORGANIZATION





(for which purpose all of the facilities of the organization are available to him), and he later checks against these early results.

In this development, owing to the desire to reduce weight to a minimum, many deflection tests were made, as well as tests at combustion temperatures, these tests applying to hold-down bolt location, plug location, exhaust-port shape, and combustion-chamber-roof deflection.

In the development of the cylinder head, the volume and shape of the combustion chamber, the location of the spark plug, and the size and shape of valves and ports are the responsibility of the carburetor engineer in the engine-design group. He is in direct charge of carburetor design and works closely with the Bay City Carburetor Division—through the production engineer at Detroit and the engine-plant engineer at Flint—on all production problems involved in carburetor design. His responsibility extends to the inlet and exhaust manifolds, as far as flow, distribution, and warm-up characteristics are concerned. The design engineer is responsible for the incorporation of the above elements in a practical design, and works through the production engineer to accomplish this result.

In theoretical studies the project engineer has the benefit of consultation with General Motors research men engaged in studies of fuel and airflow experiments. In working out practical applications, use is made of the "flow bench" in the Chevrolet laboratory. On the electrical end, aside from problems relating to the spark plug and its location, he is responsible for determining the proper spark-advance curve, for both part- and full-throttle operation. These curves are worked out in part in the laboratory, before proving-ground development is attempted. In writing up the work orders for tests of this type, the project engineer can give the tests a direction which, in his opinion, will develop the necessary data upon which the final design may be based. However, the test procedure for checking the final results is the responsibility of the test engineer. Reports of this nature record the results and compare them with previously accepted results, putting them in the final form for distribution to the engineering executives.

The electrical engineer is responsible for the electrical characteristics of the coil, distributor, wiring, etc. The design engineer correlates the design work of these two project engineers, and the assistant chief engineer establishes their contact with suppliers within the corporation and schedules their design and test work to agree with the general program.

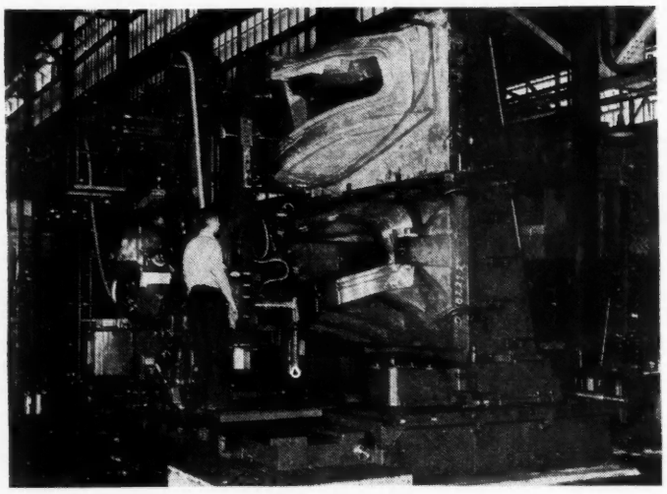
All of the above functions are carried on without scheduled conferences; the work order and reporting system of the experimental division keep the engine engineering organization informed of the progress made, and thus avoid the necessity of conferences.

In addition to laboratory and proving-ground tests, road tests are undertaken at two stages of the development in various parts of the Southwest and the Phoenix area. The first tests serve to determine actual temperatures of all units whose operation is likely to be affected by temperature. Other characteristics, such as ride and handling, are also observed, and a complete record of the day's run is furnished the executive in charge of the trip. This executive must be the chief or assistant chief engineer, test, design, or production engineer. The second tests are made after the development work has been completed on the model as it is released to production, except as regards appearance features. The technical engineer in charge of reports of these tests has no other duties.

It would seem that the foregoing procedure would afford sufficient protection, but since not all the operating conditions and demands upon the product can be foreseen and tested against, particularly in the case of commercial models, the engineering department keeps in close touch with the field situation through its service-contact man, who is directly under the chief engineer.

The Chevrolet field sales and service organization is divided into 49 zones. The service organization in each zone is responsible for the credit allowed for material and labor which the dealer claims to be defective, in adjusting owner complaints under the terms of the service policy. The engineering department has an arrangement with the service department whereby the former reviews all such claims. After the

(Turn to page 268, please)



Cutting a fender die on an automatic Keller die-cutting machine in the die department of Pontiac Motors. Each die takes about seven days on the machine and ten days for hand finish.

Production Lines

Change Over

There is no time of the year that engenders so much excitement and tenseness as does the week when a new model year starts on the assembly lines. For months the production department and the master mechanic's staff have been planning for the event and we doubt if even the oldest man on the staff has seen a year when everything ran smoothly. The first week brings the headaches but it clears the way for the thrill of having the cars come off the line next week without a hitch. The casual observer misses the drama of what goes on behind the firing line.

ASA Progress

Two important ASA projects are revealed in the current issue of *Industrial Standardization.* First is the establishment of standards for quality of electrical indicating instruments to assure known performance and operating characteristics within commercial manufacturing limits. Special significance is attached to insulation resistance as a mark of constructional quality. Work on these standards was begun back in '33. The other project has to do with the standardization of test methods relating to magnetic materials. With the impact of special proprietary magnetic alloys such as Alnico and Permalloy, it is found necessary to have an entirely different technique of testing for these alloys as distinguished from the conventional "hard" magnetic materials. Recently two methods have been adopted—one having an upper limit of 2500 oersteds, the other for permeability up to 400 oersteds. An ASTM committee is investigating still higher permeability ratings, and further revisions and improvements are expected.

Remote Control

You can credit Cadillac with the introduction of manual remote control of gear shifting, which appeared as standard equipment on Cadillac and La Salle last season. Pontiac, too, had this feature, but at an added cost of $10 per car. All of which is by way of writing the obituary for the time-honored "wobble stick," which will largely disappear on the '39 cars. This form of hook-up makes it a rather simple matter to introduce a power-shifting attachment right under the steering wheel. Added cost is 'way down as compared with last year's power shifts, and it is possible to make the installation in the dealer's establishment. We rather suspect that something of this nature will be available.

"One-Man" Top Maybe

We hear that some of the automobile manufacturers have been looking over a fascinating convertible top for roadsters. It's operated by vacuum power—which means that the engine must be kept running both for furling and unveiling. The top closes in a weather-tight seal by a turn of a lever and is released in the same fashion. To furl, you release the clamping lever, push a button to actuate a Rube Goldberg mechanism; the whole things folds neatly into a recessed pocket. To unfurl, reverse the process—push a switch to start the mechanism, turn the lever to lock in place; engine running in each case.

Hard Facts

We don't recall whether we drew your attention to a new publication —*Hard Facts*—published monthly by Wilcox-Rich. It's intended to keep you posted on current developments in proprietary hard alloys and their applications, as they issue from the W-R research labs. Vol. 1, No. 5, just received, notes the properties of a family of four W-R alloys—Xaloy, Wilrich 300, Wilrich, 350, and Wilrich 600. We'll be glad to get you acquainted.

Coil Springs

We hear that a prominent user of coil suspension springs has developed a method of treating the surface in a special Wheelabrator, after heat treatment. This surface treatment is so effective that it has been possible to cut down the initial grinding operation on the bar stock to just one pass through the centerless grinder.

Social Laws

Our friend, Joe Padgett of Spicer Mfg. Corp., has written and published a little booklet—"Abundance for the Forgotten Man"—which has attracted considerable comment. Its appeal lies in simplicity and direct approach to the economic problems of the day. As such, it is as interesting to the worker as it is to the executive. Takes but a few minutes to read. We'll be glad to send you some copies.—J. G.

New Fordson Tricycle-Type Tractor Passes Nebraska Test

OFFICIAL tractor test report No. 299 of the Agricultural Engineering Department of the University of Nebraska has been issued for a Fordson All-Around gasoline tractor manufactured by the Ford Motor Co., Ltd., of Essex, Dagenham, England.

This tractor, which is of the so-called tricycle type (more generally called the all-purpose type in this country) is equipped with a four-cylinder, vertical, L-head engine of 4⅛-in. bore and 5-in. stroke. Inlet- and exhaust-valve ports are of 1.62 in. diameter. Equipment includes a Robert Bosch high-tension magneto, a 1¼ in. Zenith carburetor, a Handy variable-speed centrifugal governor, and a Handy Pre-cleaner and oil-washed, wire-screen filter. The engine is governed at a nominal speed of 1100 r.p.m.

The rear-tread width is adjustable and can be varied between limits of 56 and 88 in. At the front the two closely-set wheels are inclined so as to make the tread width at the bottom 6½-in. and at the top, 11¾ in. The drive wheels are described as of the skeleton type, of 50 in. diameter and 2-in. face, and can be provided with 24 overhanging-type spade lugs each, the lugs being 4¾ in. high and 3½ in. wide. Front wheels are of the cast type, 24 in. in diameter by 4 in. face. Rear wheels can be equipped with 9.00/36 in. six-ply rubber tires which are inflated to 16 lb. pressure, while the front wheels may be fitted with 5.50/16-in. rubber tires inflated to 32 lb. pressure. Rubber tire equipment adds 552 lb. to the weight of each rear wheel.

In the tests, which were made May 9 to 20, gasoline of 57 octane rating was used as fuel, its density being 6.11 lb. per gallon. The lubricating oil used was S.A.E. No. 40; 5.731 gal. was put into the engine, and 3.338 gal. was drained from it, so the consumption was 2.393 gal. The tests extended over 68 hours.

The results of the tests are given in the following tables:

No repairs or adjustments were made during the tests. All results given under the heading of Belt Horsepower Tests were determined from observed data, without allowances, additions or deductions. Tests B and F were made with the carburetor set for 100 per cent maximum belt horsepower, and data from these tests were used in determining the horsepower to be developed in tests D and H respectively. Tests

BELT HORSEPOWER TESTS

H. P.	Crank Shaft Speed R. P. M.	Fuel Consumption			Water Used Gal. per hr.	Temp. Deg. F.		Barometer Inches of Mercury
		Gal. per hr.	H. P. hr. per gal.	Lb. per H. P. hr.		Cooling med.	Air	
TEST B—100% MAXIMUM LOAD—TWO HOURS								
28.44	1100	3.501	8.12	0.752	0.021	199	71	28.785
TEST C—OPERATING MAXIMUM LOAD—ONE HOUR								
27.69	1100	2.966	9.34	0.654	0.086	200	65	28.780
TEST D—ONE HOUR								
25.46	1100	2.761	9.22	0.663	0.077	189	66	28.805
TEST E—VARYING LOAD—TWO HOURS (20 minute runs: last line average)								
25.40	1098	2.764	9.19	0.665	—	187	66	—
0.72	1255	1.321	0.55	11.208	—	151	68	—
13.96	1201	2.136	6.54	0.935	—	162	69	—
26.31	1017	3.172	8.29	0.737	—	189	68	—
7.21	1239	1.689	4.27	1.431	—	164	68	—
20.24	1166	2.445	8.28	0.738	—	174	68	—
15.64	1162	2.255	6.94	0.881	0.008	171	68	28.815

DRAWBAR HORSEPOWER TESTS

H. P.	Draw Bar Pull Pounds	Speed Miles per hr.	Crank Shaft Speed R. P. M.	Slip on Drive Wheels %	Fuel Consumption			Water Used Gal. per hr.	Temp. Deg. F.		Barometer Inches of Mercury
					Gal. per hr.	H. P. hr. per gal.	Lb. per H. P. hr.		Cooling med.	Air	
STEEL WHEELS	**TEST F—100% MAXIMUM LOAD—SECOND GEAR**										
19.25	2307	3.13	1100	2.74	—— Not Recorded ——				187	59	28.650
TEST G—OPERATING MAXIMUM LOAD											
16.75	3062	2.05	1102	3.62	—— Not Recorded ——				185	59	28.620
17.35	2073	3.14	1098	2.32	—— " " ——				183	59	28.815
13.59	917	5.56	1097	1.63	—— " " ——				202	77	28.485
TEST H—TEN HOURS—SECOND GEAR											
15.05	1803	3.13	1100	2.69	2.636	5.71	1.070	0.011	179	65	28.625
FUEL ECONOMY TEST—FOUR HOURS—THIRD GEAR											
11.76	796	5.54	1100	2.19	2.563	4.59	1.332	0.029	182	72	28.695
RUBBER TIRES	**TEST G—OPERATING MAXIMUM LOAD**										
13.80	3058	1.69	1099	17.80	—— Not Recorded ——				184	72	28.630
19.99	2811	2.67	1101	14.56	—— " " ——				210	77	28.630
21.09	1532	5.16	1102	6.19	—— " " ——				192	80	28.625
FUEL ECONOMY TESTS—FOUR HOURS EACH—SECOND AND THIRD GEARS											
17.93	2391	2.81	1099	9.76	2.526	7.19	0.861	0.064	176	60	28.815
18.24	1315	5.20	1100	5.21	2.640	6.91	0.884	0.000	190	79	28.615

C, D, E, G, and H were made with an operating setting of the carburetor (selected by the manufacturer) of 97.4 per cent of the maximum belt horsepower.

The observed maximum outputs were 19.25 hp. on the drawbar and 28.44 hp. on the belt. Corrected to sea-level conditions the outputs were 20.08 drawbar hp. and 29.89 belt hp. The report also gives the figures for 75 per cent of the calculated maximum drawbar hp. and 85 per cent of the calculated maximum belt horsepower (formerly referred to as A.S.A.E. and S.A.E. ratings) which are 15.06 and 25.41 drawbar and belt hp. respectively.

Lubricating Oils and Oxides of Nitrogen

A STUDY of the influence of the oxides of nitrogen—which are formed in considerable quantity in the cylinders of internal-combustion engines—on the oxidation of lubricating oils was made by T. K. Hanson and A. C. Egerton and reported upon in a communication to the Institution of Mechanical Engineers (Great Britain) in October, 1937. It is shown that these oxides, in the measure in which they are absorbed by the oils, act as oxidation catalysts, and either reduce or increase the induction period. The incorporation of urea diphenyl or of iron sesqui-oxide counteracts the catalytic effects of the oxides. It is pointed out that if the oxidation catalysts produce rapid darkening of the oil, they have little influence on its viscosity.

Gas Producers Ask Concessions

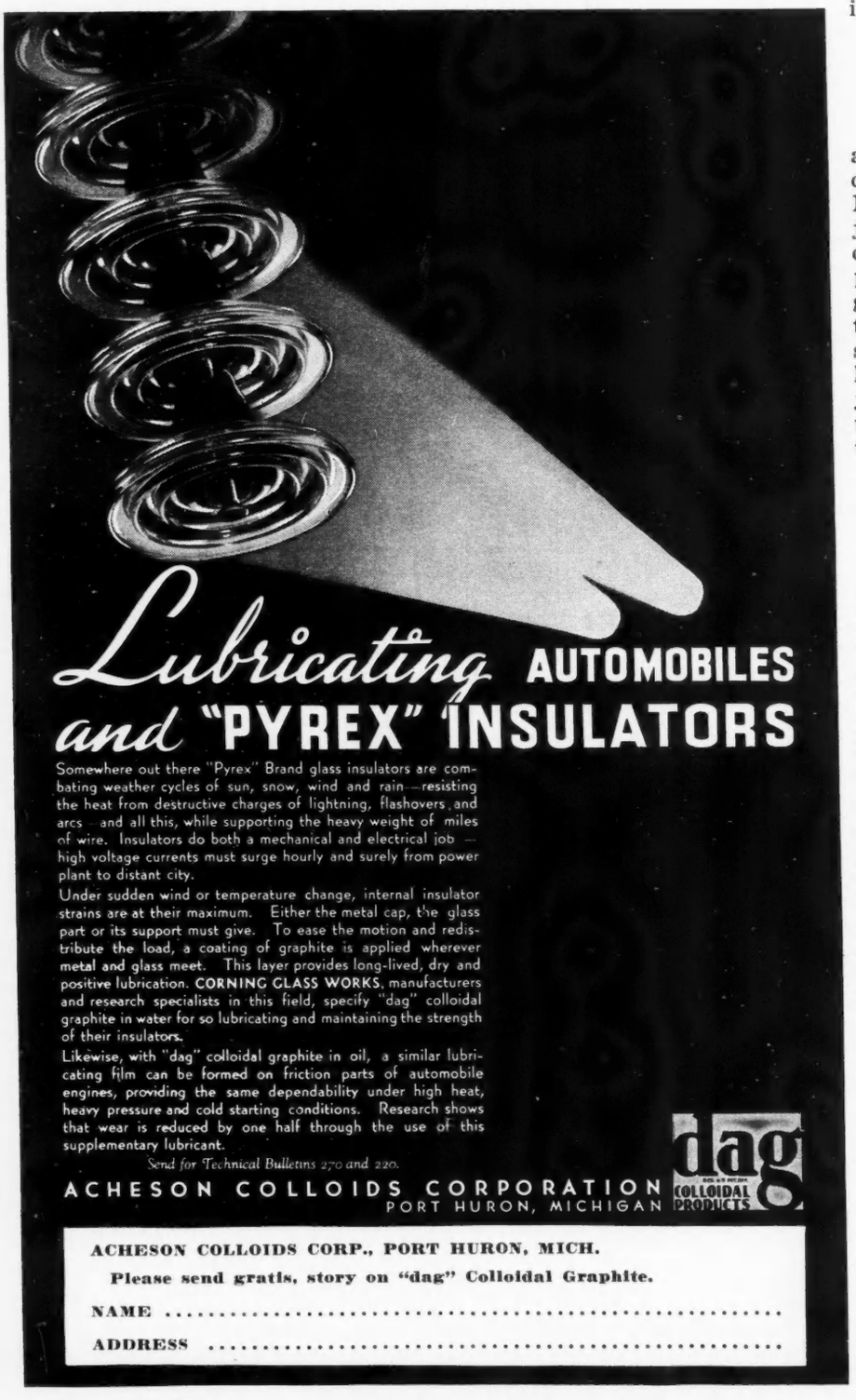
A deputation representing makers and users of gas-producer road vehicles recently called on the (British) Minister of Transport with the object of informing him concerning recent technical developments in the production of road vehicles using gas producers as sources of fuel and to ask him to grant certain concessions in respect to speed and weight limits, similar to those already enjoyed by steam and electric vehicles, to encourage the development of this type of vehicle.

Experimental Testing at Chevrolet

(Continued from page 265)

claims are properly coded and indexed, the material and information as to operating conditions, etc., is turned over to the engineering department upon request. This information is passed on by the service-contact man to the design and plant engineers, for their comment and action. Copies of it go to the executive engineers. The findings and comments of these men are passed back to the service-contact man, for his guidance in issuing recommendations to the central-office service department, on the authority of the chief engineer.

This method places the engineering department in a position to make use of factual information in revising its test procedures in accordance with actual field conditions. The decision to do so rests with the chief engineer. The design and project engineers are thus acquainted with the problems encountered in special types of operation, and the plant engineers are in a position to take action through their quality check-up system, provided the responsibility lies with the manufacturing department.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